

PAVEMENT PERFORMANCE REPORT



Pavement Management System

August 2003

A faded background image showing construction workers on a road project. In the foreground, two workers are using tools on the pavement. In the background, a worker is operating a piece of heavy machinery, possibly a paver or grader. The scene is outdoors on a dirt or gravel surface.

This report was produced by the

**Idaho Transportation Department,
Division of Transportation Planning
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If you have questions or would like to request more information on Idaho's Pavement Management System, please call Mark Wheeler at (208) 334-8887.

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PURPOSE



Photo: ITD's Pavement Management Program utilizes the data recorded by an automated data-collection vehicle, which travels every mile of the state highway system.

PURPOSE

This report provides information regarding the condition of pavements on the State Highway System. The following pages contain numerous charts, graphs, and maps of past and present pavement condition based upon cracking, roughness, and rutting. This information was obtained from Idaho's Pavement Management System (PMS).

This report is comprised of the following sections:

- Executive Summary
- Pavement Management - System Overview
- General Information
- Pavement Condition
- Needs Analysis
- Sealcoats
- Summary

EXECUTIVE SUMMARY

ACHIEVEMENTS

The Idaho Transportation Department has made significant progress toward reducing deficient pavements and giving motorists a safer and smoother ride. Pavement deficiencies on the State Highway System have been reduced from almost 40% in 1993 to 15% by the end of calendar year 2002. Reducing pavement deficiencies is a high priority for the department and has been accomplished by:

- The Idaho Transportation Board committing \$31 million annually for pavement rehabilitation
- Establishing department efficiency measures
- Consolidating programs and applying the cost savings to pavement-rehabilitation projects
- Partnering with the private sector allowing the department to stretch highway dollars
- Utilizing a successful maintenance / preventative maintenance program which slows the rate of pavement deterioration
- Improving the way we collect, analyze, and report pavement data

**Statewide Pavement Deficiencies
1997 - 2002**

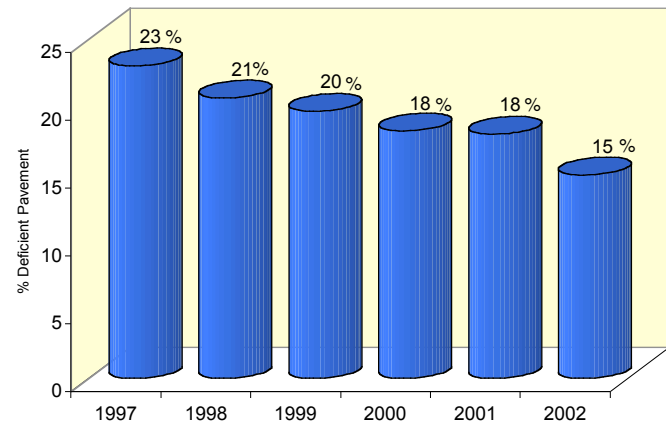
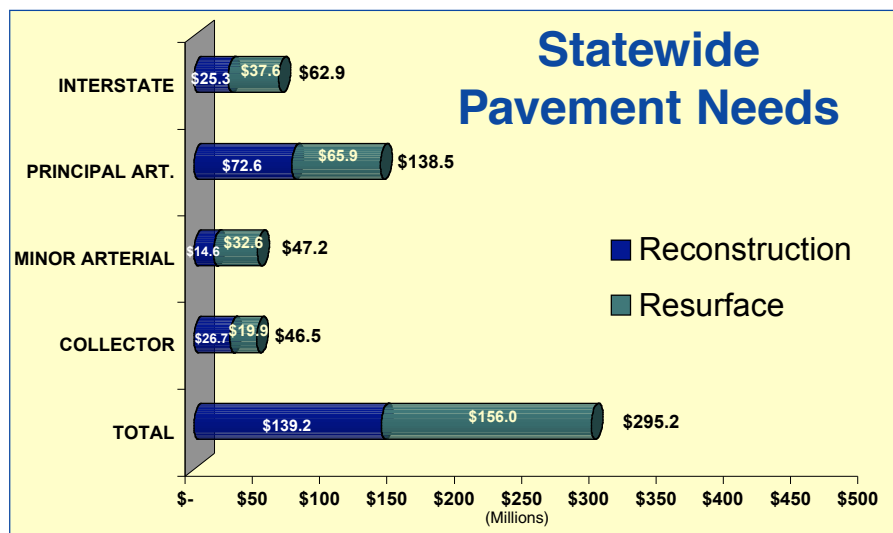


Figure 1.

NEEDS

Pavements on the State Highway System have shown a great deal of improvement in recent years, but there is still much work left to do. Figure 2 below is a summary of current statewide needs by functional class. The estimated repair costs on the state highway system alone total nearly \$300 million and this is just one piece of the total transportation pie. Capacity, congestion, safety, and economic development all compete with pavement-improvement needs for limited funding.



Because Idaho's growing population and economy are likely to create a demand for more and heavier trucks, the department must continue its commitment to protect and maintain Idaho's investment in pavements on the State Highway System.

Figure 2.

Section 1 PAVEMENT MANAGEMENT SYSTEM OVERVIEW



In 1977, the Idaho Transportation Department (ITD) began a review of existing pavement-management programs with the goal of adopting one to fit Idaho's needs. The following year a Pavement Performance Management Information System (PPMIS) was acquired and made operational on ITD's mainframe computer. Since 1978, the PPMIS has been steadily improved and modified to meet conditions in Idaho. It has been tested and refined by ITD and consultant contract, the principal consultant being Pavement Management Systems Ltd., of Ontario, Canada. The last phase, economic analysis and optimization, was completed in July 1986.

Our Idaho State Highway System consists of approximately 5,000 centerline miles of paved highway, including 612 centerline

miles of Interstate. For network-level pavement management the system has been divided into about 1,800 sections varying in length from less than one mile to approximately ten miles.

Idaho's Pavement Management System (PMS) covers both the network and project level. Network-level pavement management is performed by the Division of Transportation Planning while project-level pavement management is performed by ITD's Headquarters Materials section. Pavement condition testing conducted at the network level is also split, with Materials overseeing skid testing while Planning Services collects roughness and rutting measurements. Planning Services is also responsible for surveying pavement distress (cracking), analyzing network PMS data,

producing reports, and developing and maintaining computer programs needed for pavement management. Deflection data for project-level pavement management is collected, analyzed, and reported by the Materials section.

PAVEMENT-CONDITION TESTING

Pavement-condition data is an important component of Idaho's PMS. Two-lane roads are tested in one direction while interstates and divided arterials are tested in both ascending and descending directions. Pavement-condition data elements are collected as follows:

- **Road Roughness** - Roughness is a primary indicator of pavement serviceability; or the ability of a pavement to meet the demands and expectations of motorists. In Idaho, the public's perception of the State Highway System is very important. For that reason, a Roughness Index (RI) was adopted that correlates the longitudinal profile of the road surface to an index based upon the public's perception of road roughness. The (RI) ranges from 0.0 to 5.0 (0.0 being extremely rough and 5.0 being perfectly smooth).

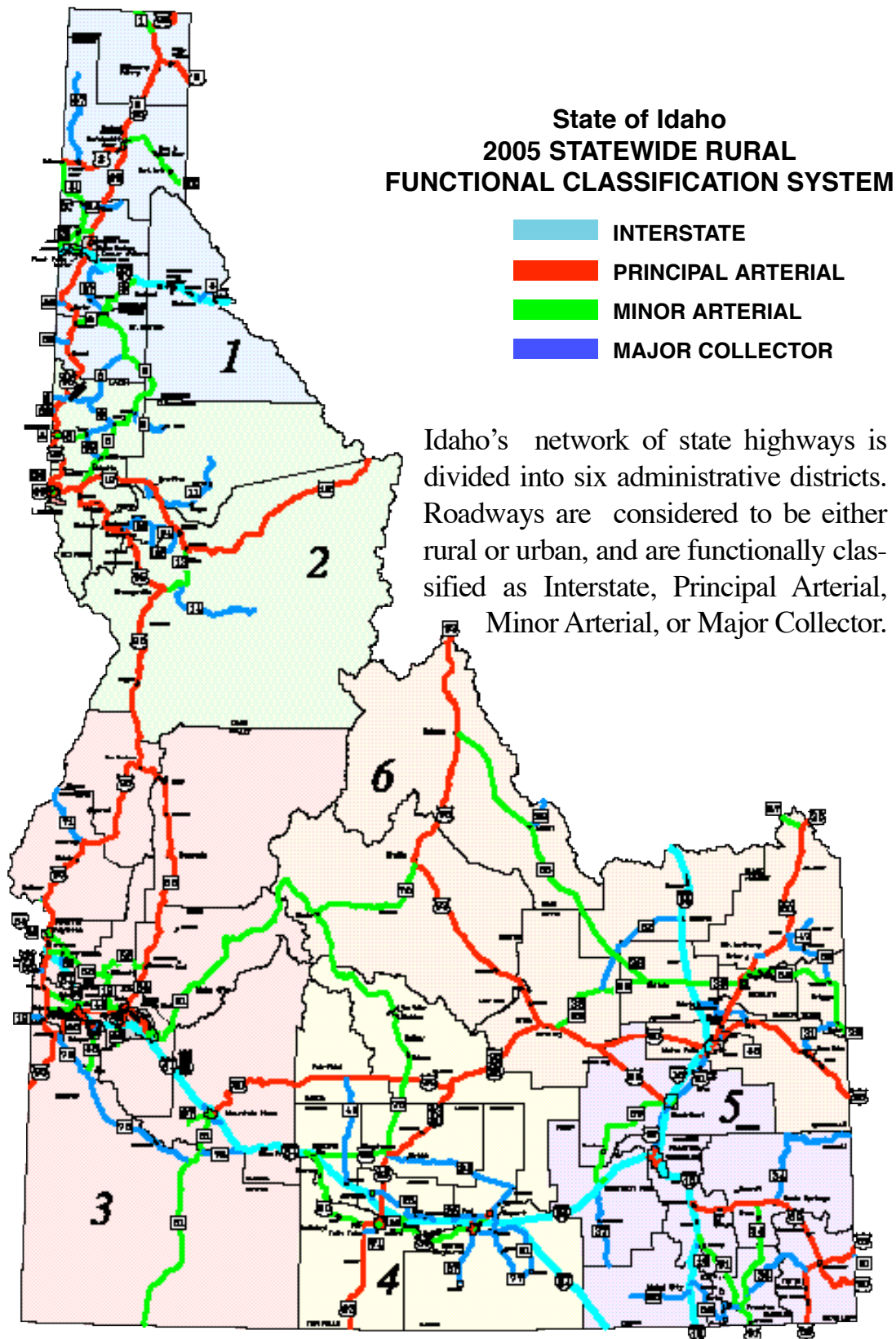
A South-Dakota-type Profilometer is currently used by ITD to obtain pavement roughness. This instrument uses laser sensors and a personal computer to collect and store road-profile information. The vehicle stores profile and rutting measurements at one-foot intervals traveling at highway speeds, and is mounted in a van operated by Planning Services. Longitudinal profiles of all pavement-management sections statewide are obtained annually.

- **Pavement Distress (Cracking)** -

Pavement distress, or cracking, is another important indicator of pavement condition. The video-inspection vehicle used to collect profile information also collects digital images of pavement on the entire State Highway System each year. The Pavement Management Engineer then uses the digital images to determine the type, extent, and severity of cracking within each PMS section. Based on this input a Cracking Index (CI) is calculated for each section. The CI is a rating very similar to the RI with 5.0 corresponding to a section with little or no cracking and 0.0 representing a section with severe cracking.

- **Final Index** - A Final Index (FI), which is the average of RI and CI, is used as a single indicator of Pavement Condition in many PMS reports.

Section 2 GENERAL INFORMATION



Map 1

2002 Centerline Miles by District

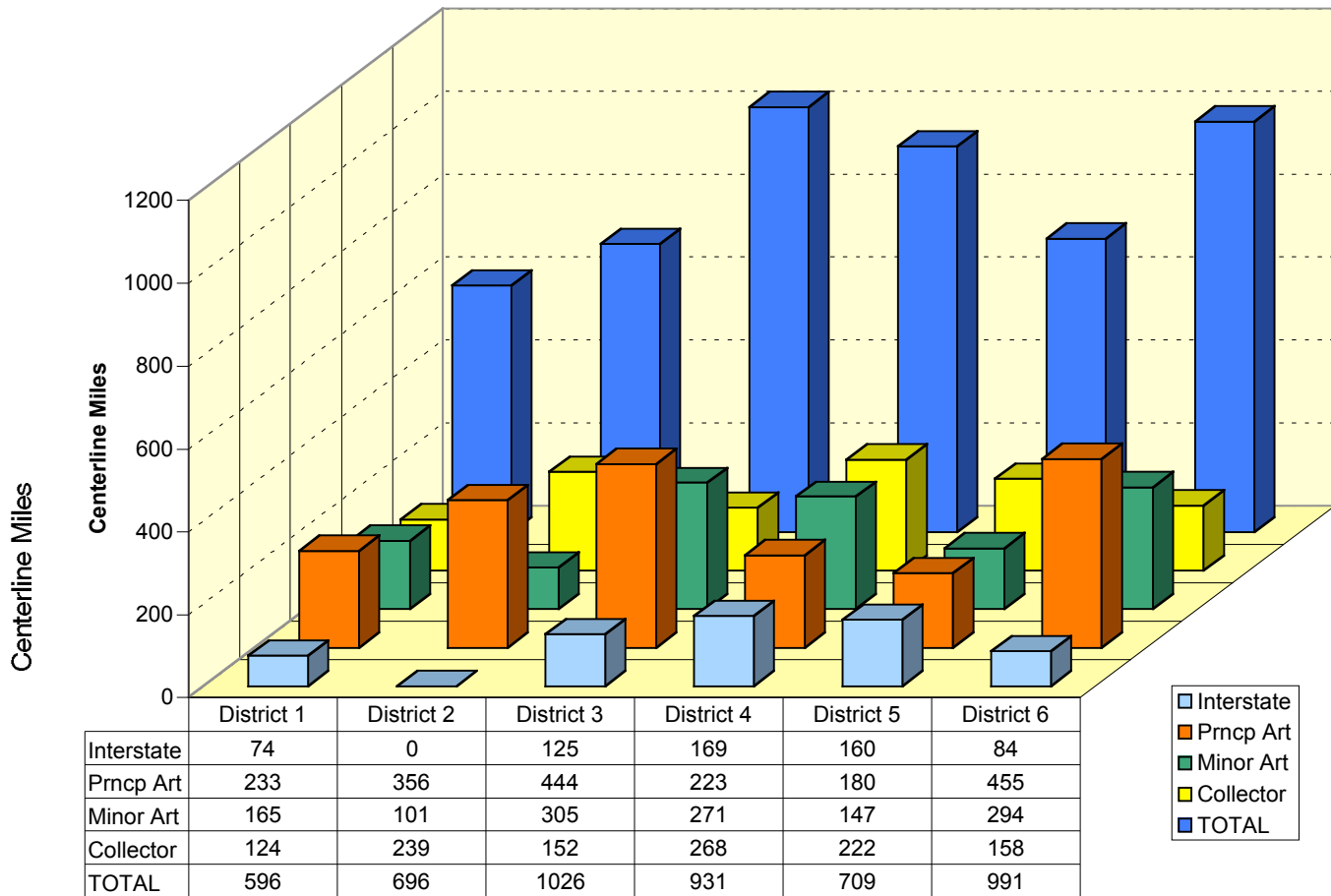


Figure 3.

Centerline mileage, by district and functional class, is shown in Figures 3, 4, and 5. There are 4,949 centerline miles on the state highway system. District 3 is the largest district with 1,026 centerline miles (20.7% of total statewide miles) and District 1 is the smallest of the six districts with 596 centerline miles (12% of total mileage).

2002 Statewide Centerline Miles

(By Functional Class)

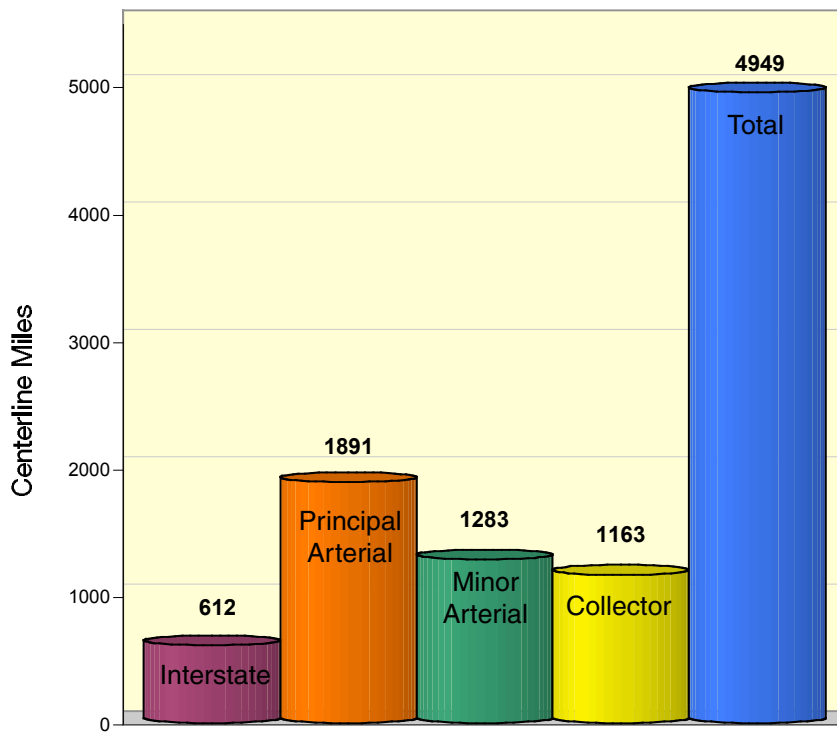


Figure 4.

2002 Centerline Miles by District

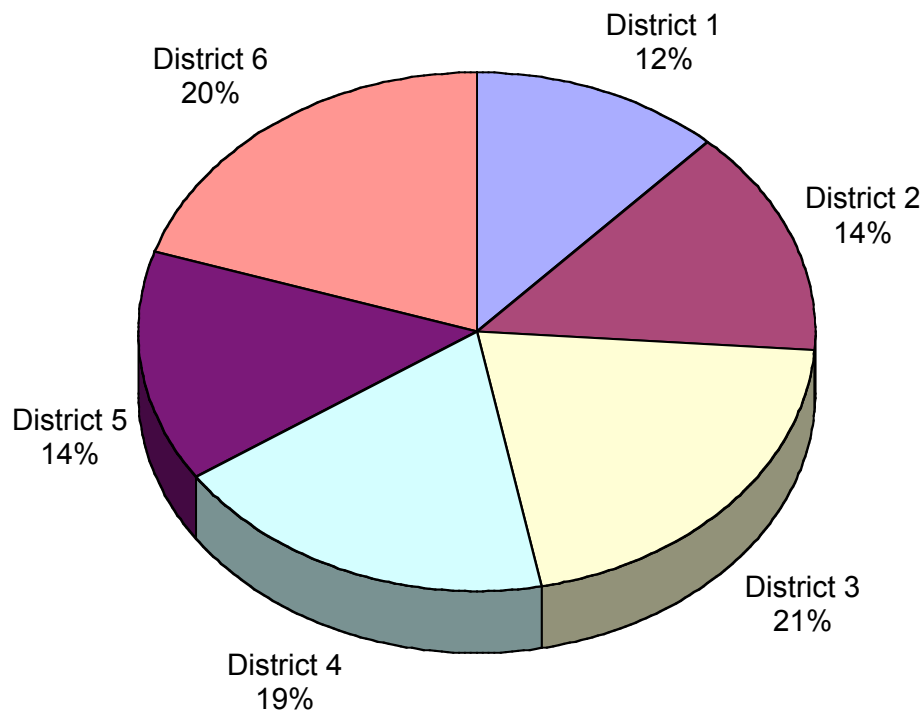


Figure 5.

2002 Lane Miles by District

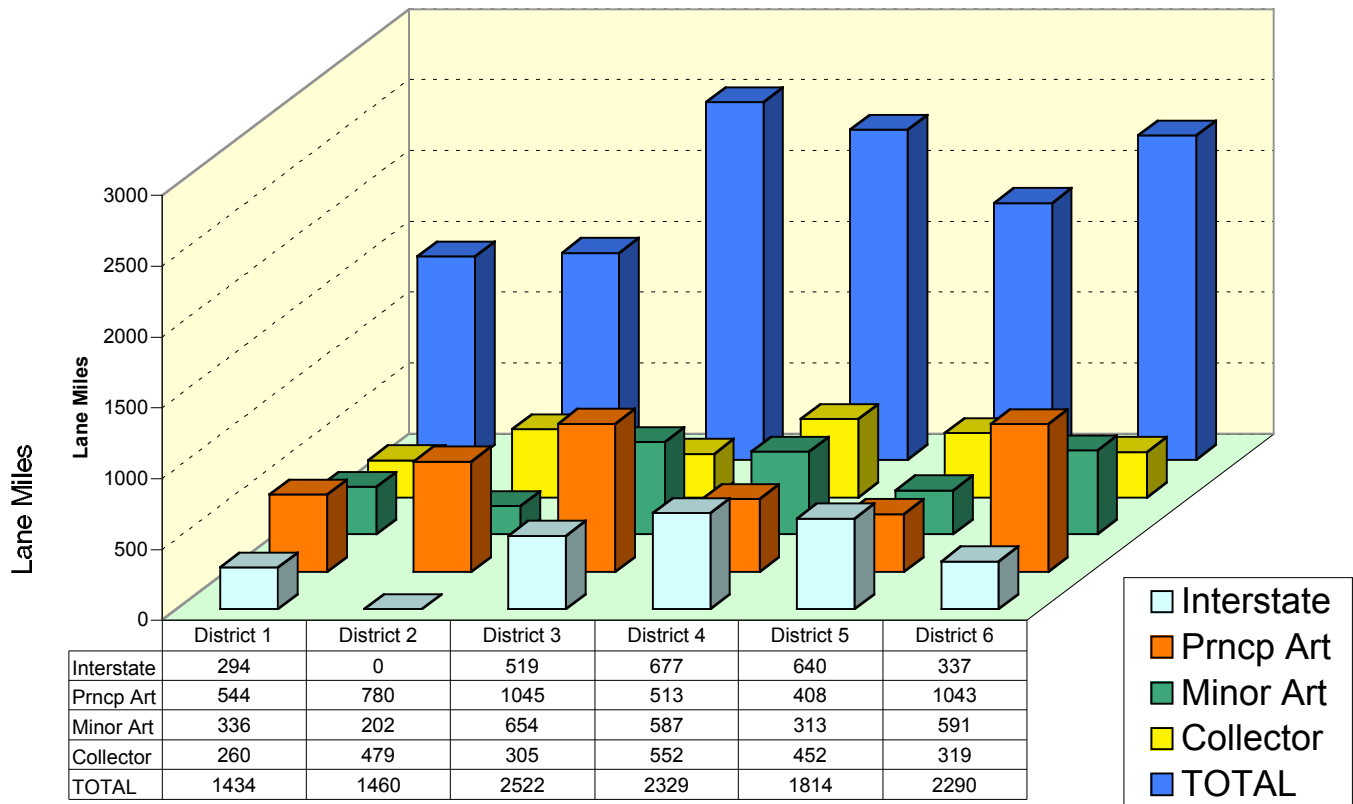
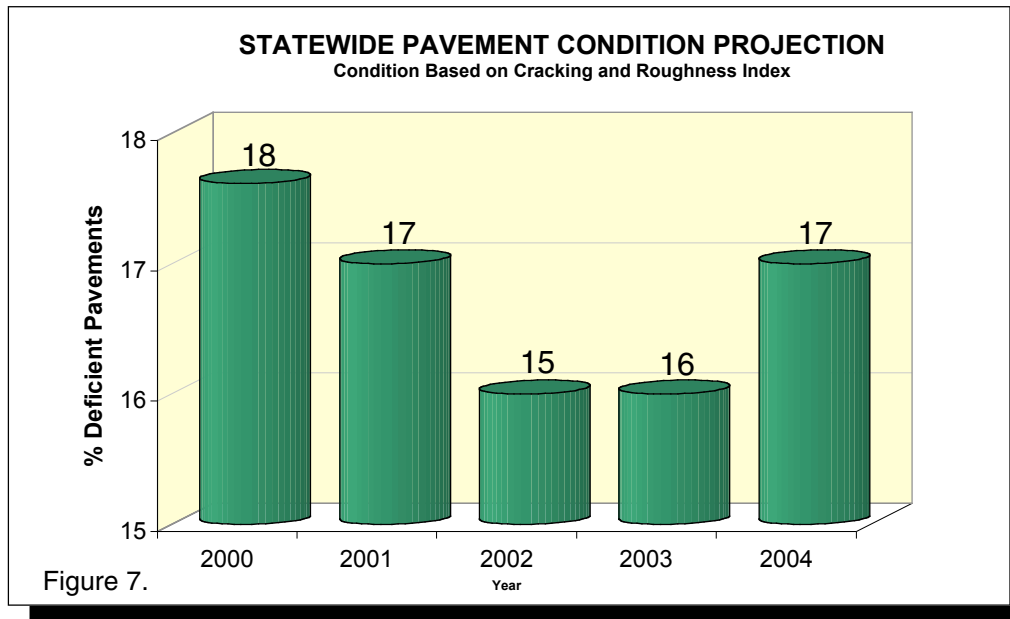


Figure 6.

Figure 6 is a summary of lane miles by functional class. Lane miles are calculated by multiplying centerline miles by the number of through lanes. The State Highway System has approximately 11,850 lane miles.

Section 3 PAVEMENT CONDITION



PAVEMENT CONDITION

Pavement condition assessment is highly dependent upon functional classification and is divided into two categories: (1) interstates and arterials, (2) collectors.

- Pavements on interstates, arterials, and collectors are classified as good if the lower of the Cracking Index (CI) or Roughness Index (RI) is greater than 3.0;
- Interstate and arterial pavements are considered fair if the lower of CI or RI is between 2.5 and 3.0 (2.0 to 3.0 for collectors);

- Poor pavements exhibit indices between 2.0 and 2.5 (1.5 to 2.0 on collectors);
- Interstate and arterial pavements considered to be very poor are those with the lower of the two indices falling below 2.0, or a CI or RI rating below 1.5 for collectors.
- Pavement sections are considered deficient if they are classified as poor or very poor.

The current statewide distribution of good, fair, poor, and very poor pavements, based upon roughness and cracking, is shown on page 10 in Figures 8 and 9.

Pavement Condition	Interstates and Arterials	Collectors
	Lower Index of Cracking (CI) or Roughness (RI)	
Good	(CI or RI) > 3.0	(CI or RI) > 3.0
Fair	2.5 ≤ (CI or RI) ≤ 3.0	2.0 ≤ (CI or RI) ≤ 3.0
Poor	2.0 ≤ (CI or RI) < 2.5	1.5 ≤ (CI or RI) < 2.0
Very Poor	(CI or RI) < 2.0	(CI or RI) < 1.5

Distribution of Cracking and Roughness Indices

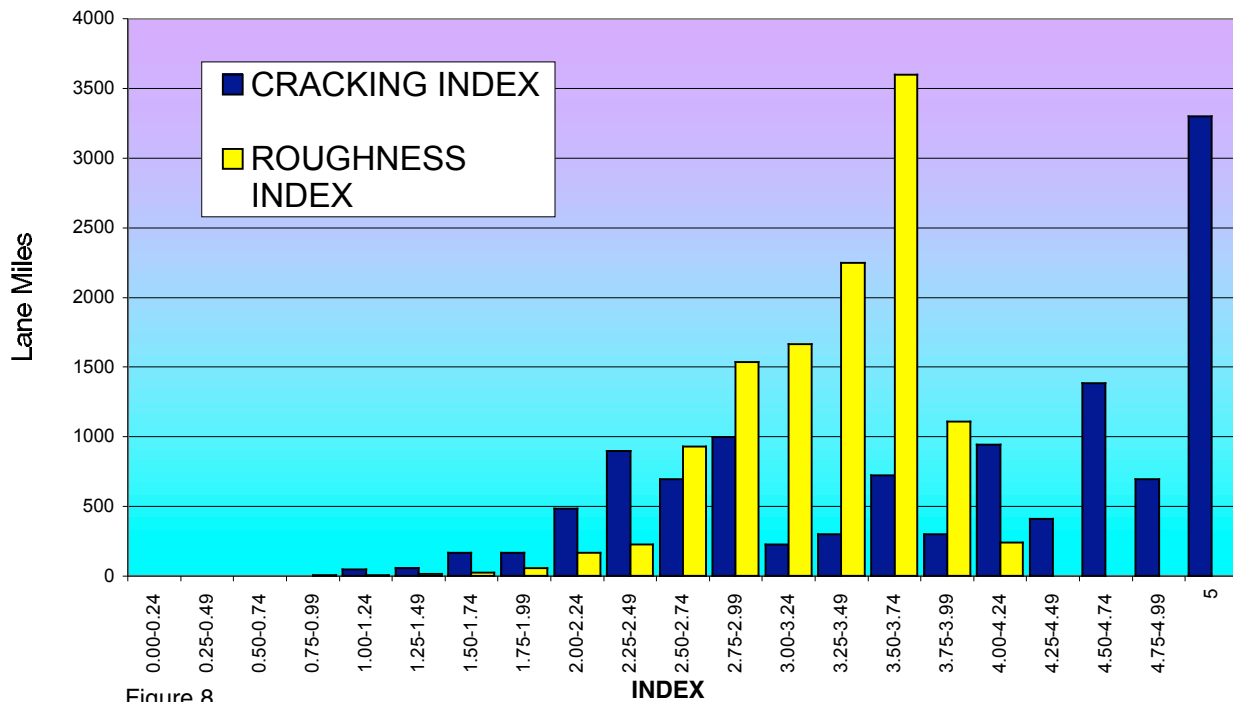


Figure 8.

Distribution of Lowest Index (Cracking or Roughness)

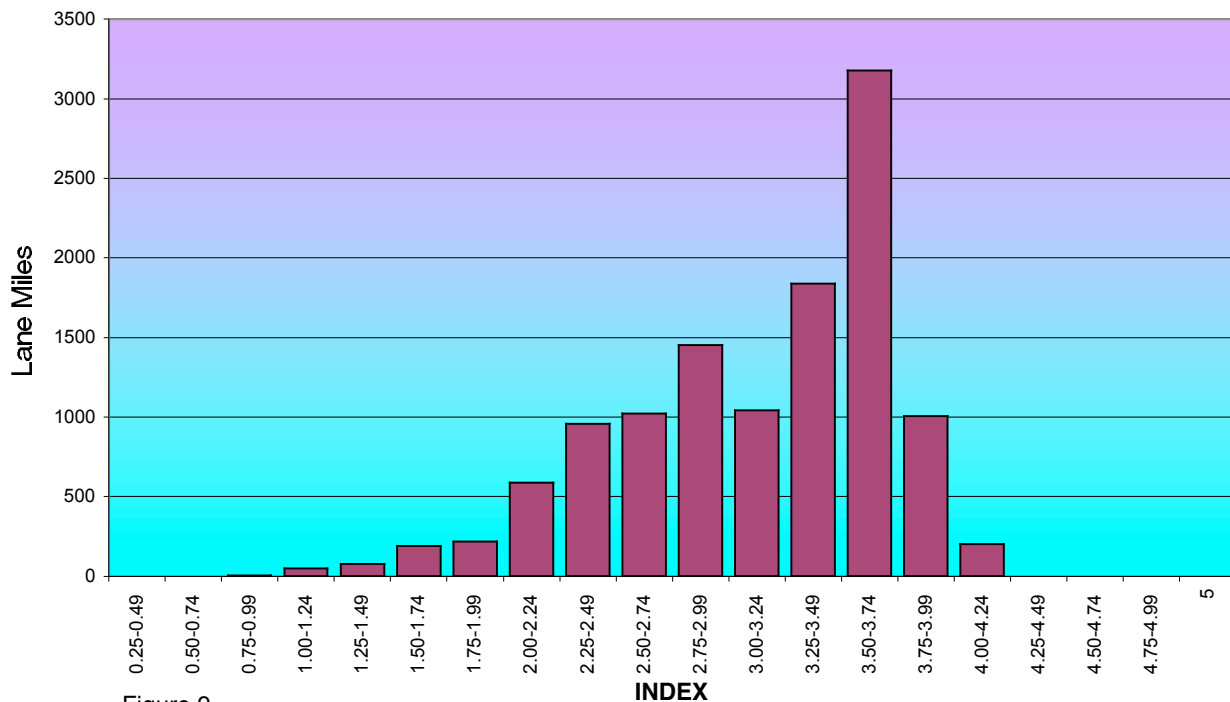


Figure 9.

PAVEMENT CONDITION (continued)

Figures 10 and 11 are summaries of pavement conditions from 1998 through 2002. The percentage of pavements considered good has risen from a statewide low of about 18.7% in 1994 to approximately 61% as shown for the end of calendar year 2002. Fair pavements have declined from approximately 44% in 1994 to 24% for 2002. The percentage of pavements considered poor or very poor has declined from a maximum of almost 38% in 1994 to 15% at the end of calendar year 2002.

Figure 12 is a pie chart representing current pavement condition on the State Highway System in terms of percent “good,” “fair,” “poor,” and “very poor.”

Current pavement condition by district is shown in Figure 13. The percentages in Figure 13 are based on statewide lane miles. For example, 11% of all pavements statewide considered good, and 9% of all pavements considered very poor are located in District 1.

Figure 14 is also a summary of pavement condition based on total lane miles in each district, as opposed to statewide mileage. For example: 4% of District 1 roadways are considered very poor; and 63% of District 5 roadways are considered good.

STATEWIDE PAVEMENT CONDITION

By Lane Miles

Condition based on Cracking and Roughness Index

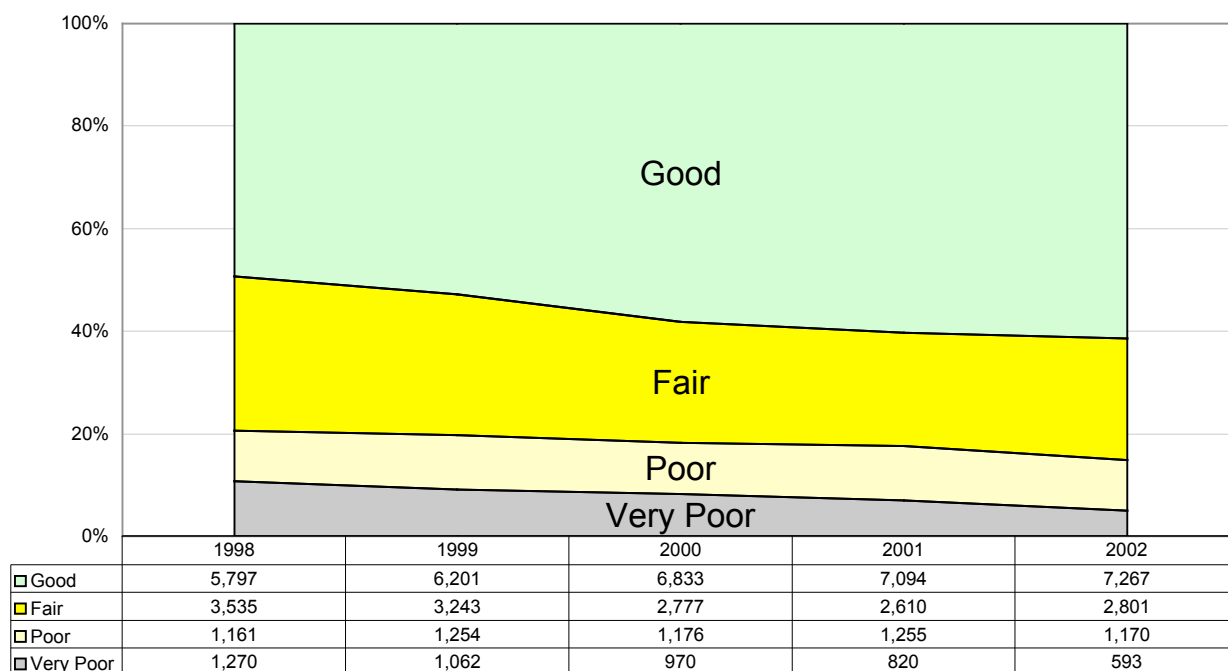


Figure 10.

District Pavement Condition by Lane Miles

Condition based on cracking and roughness indices

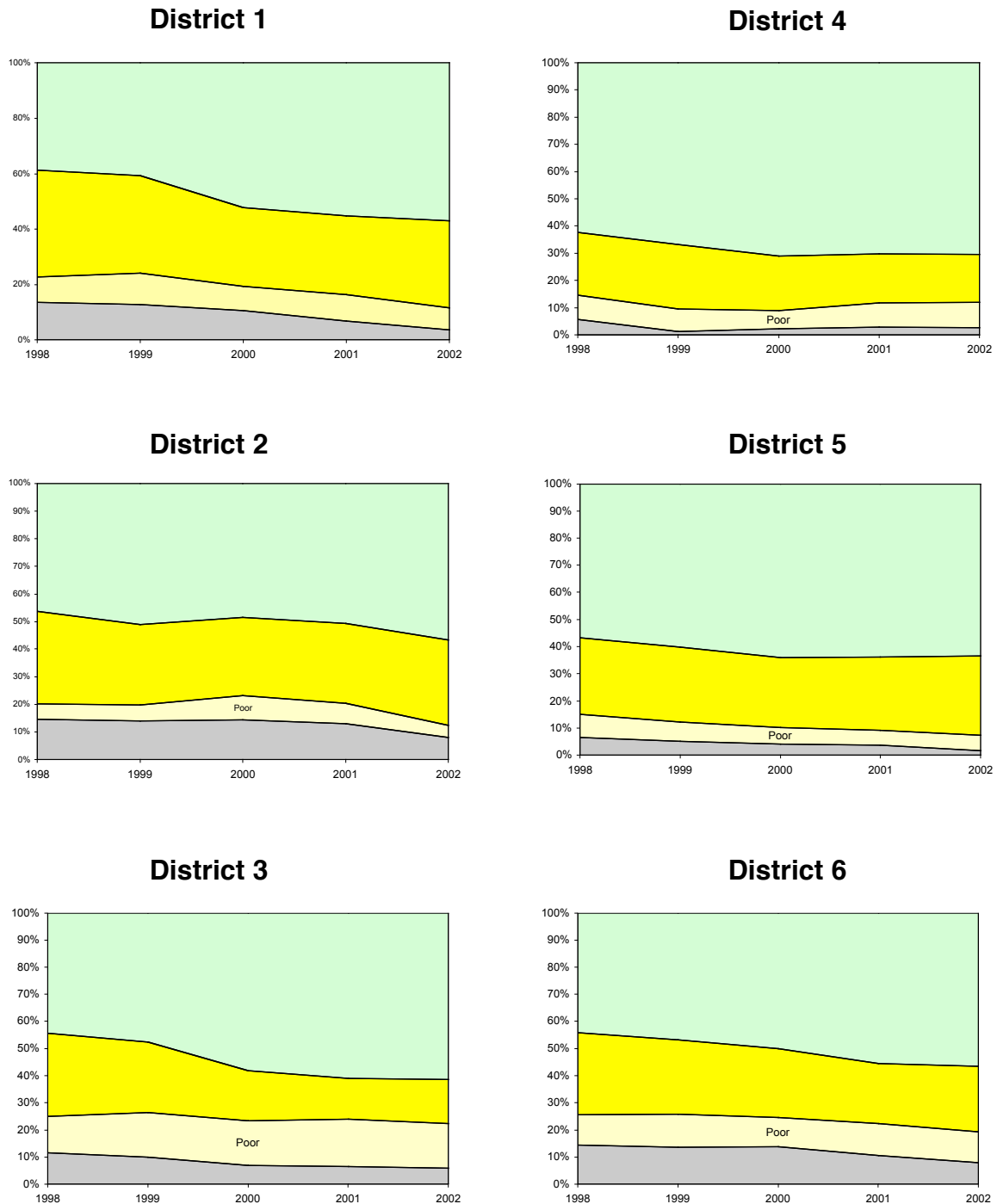


Figure 11.

2002 Statewide Pavement Condition

Condition Based on
Cracking and Roughness Index

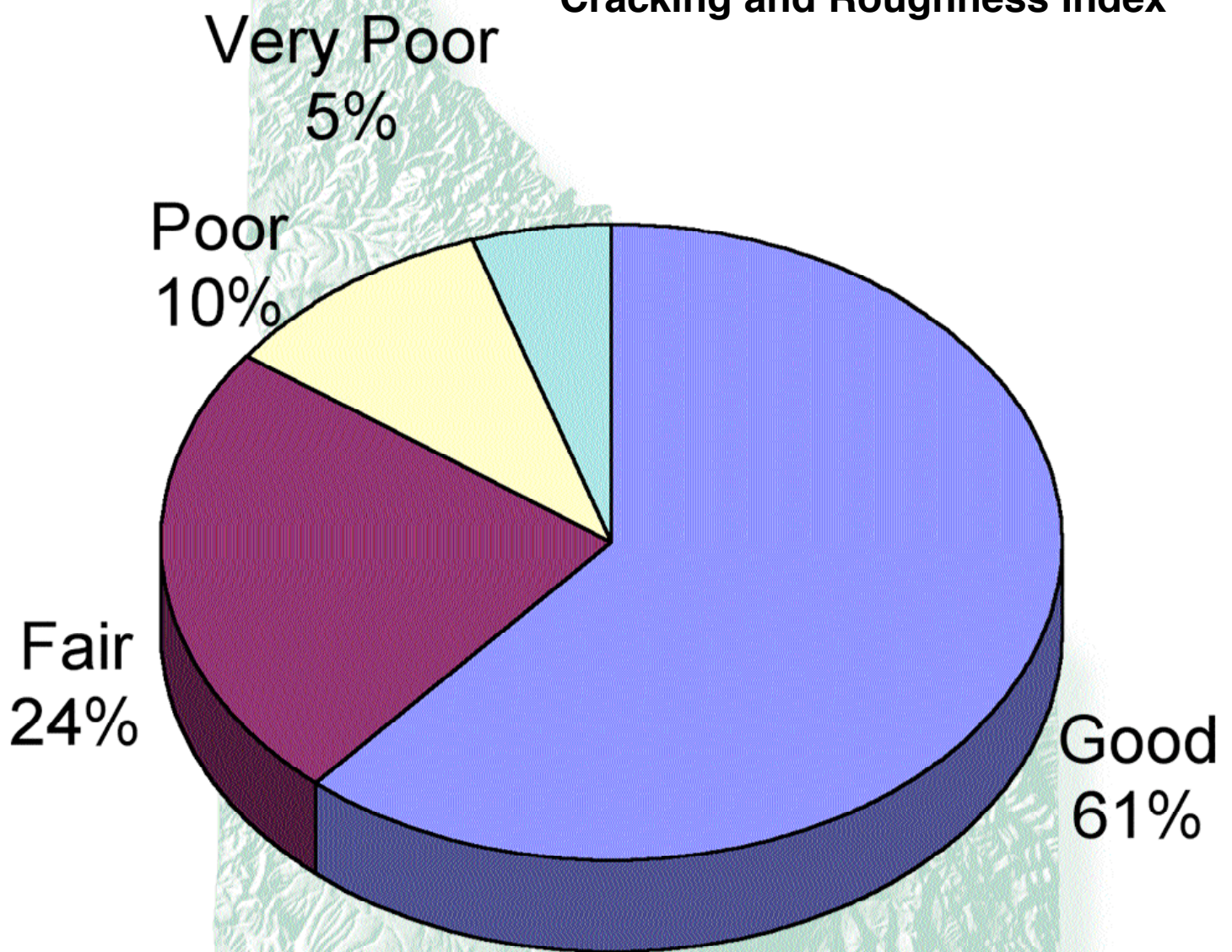


Figure 12.

2002 Pavement Condition

(District Percentage of Statewide Total)

Condition Based on Cracking and Roughness Indices

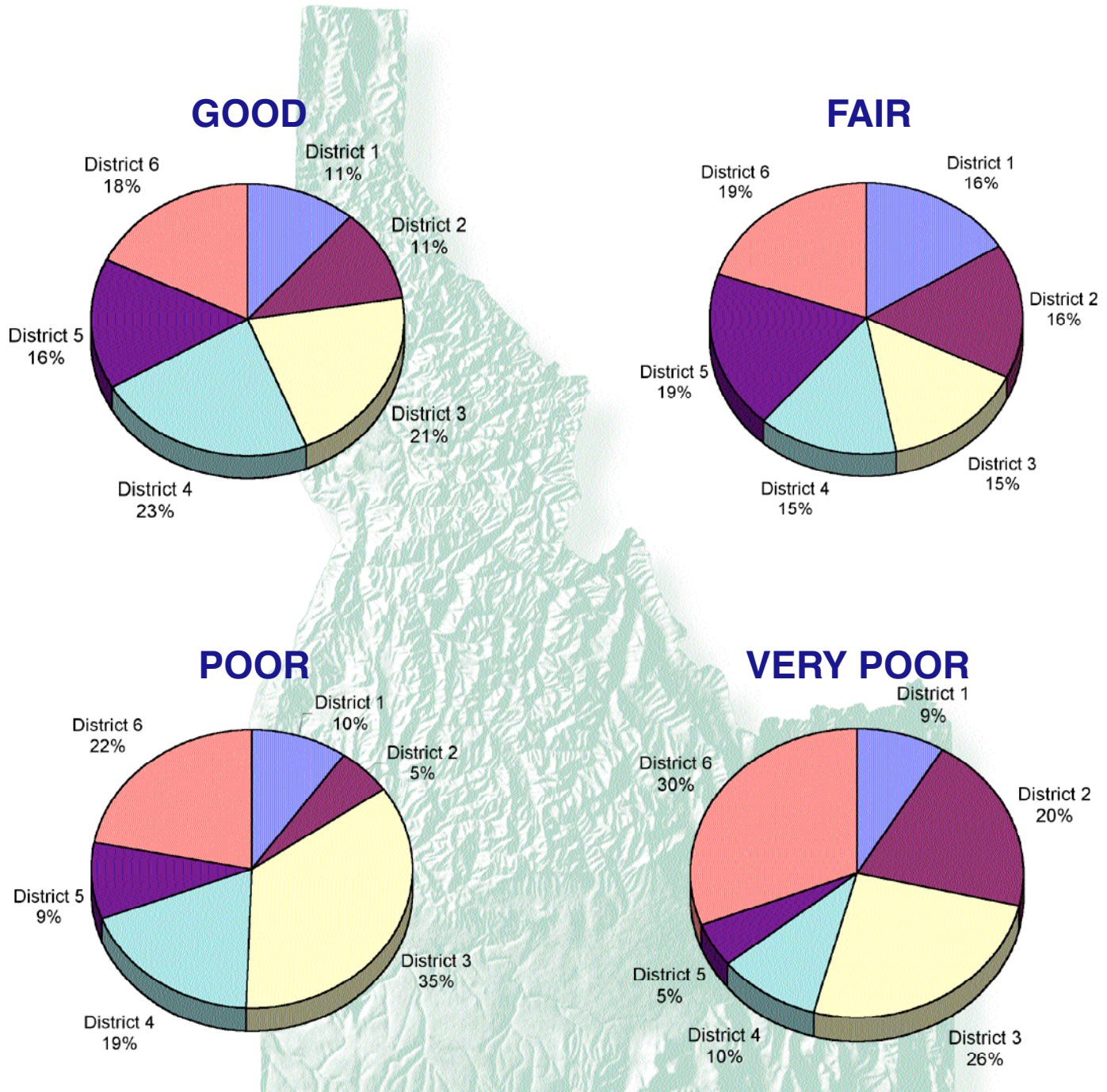


Figure 13.

2002 District Pavement Condition

Condition Based on Cracking and Roughness Indices

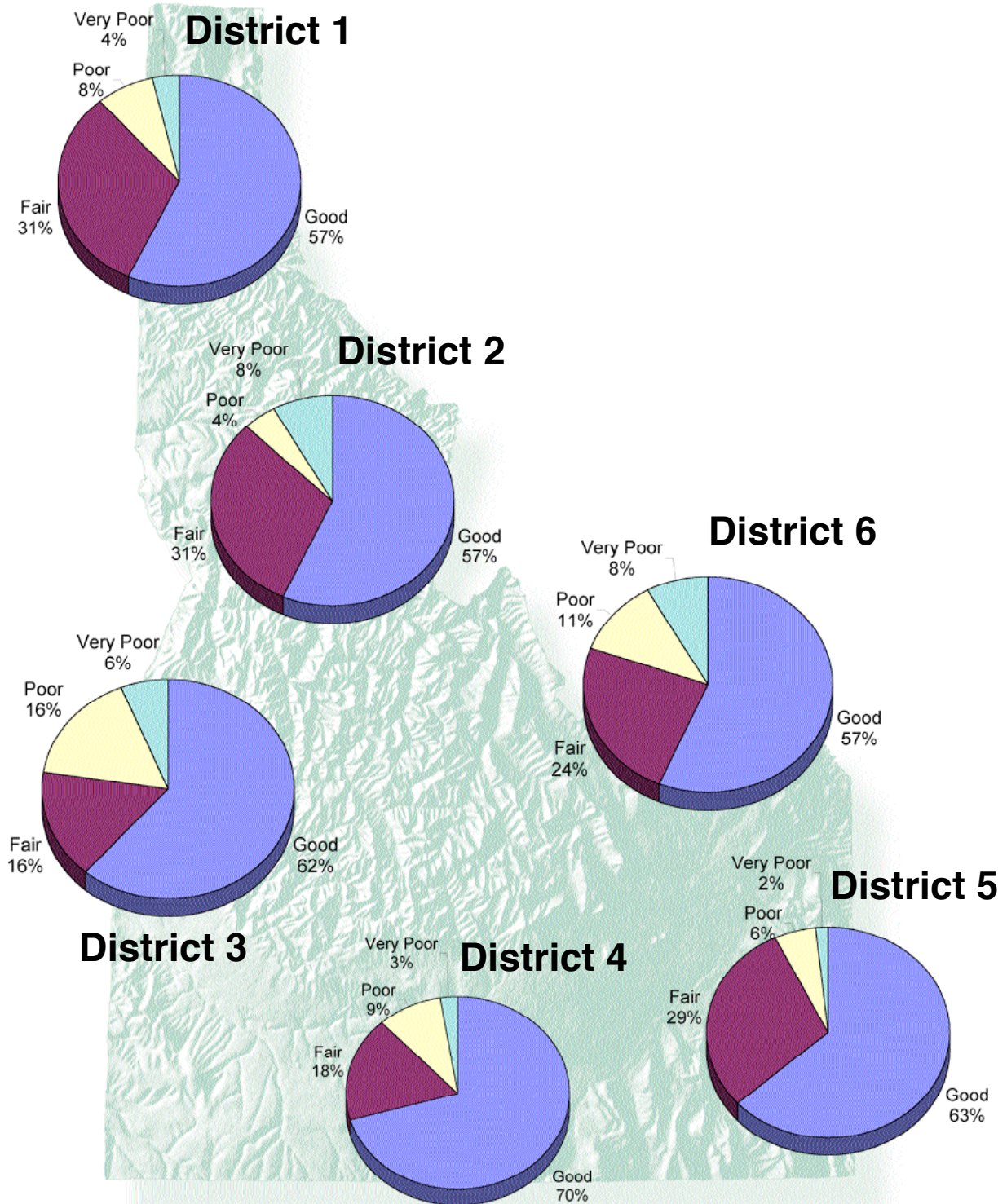
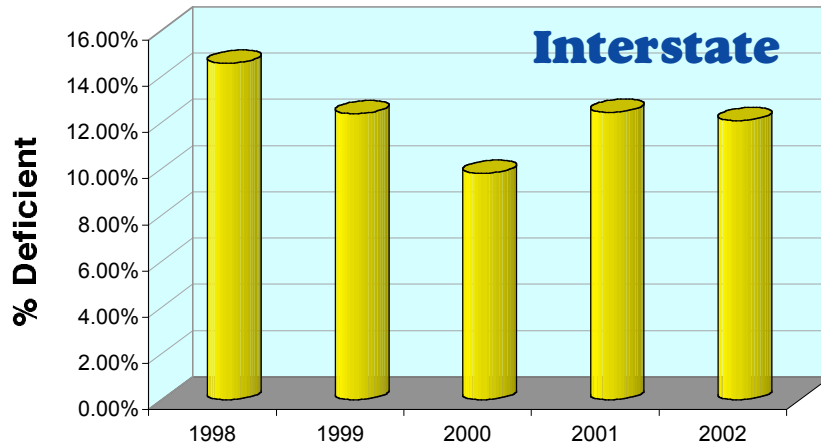


Figure 14.

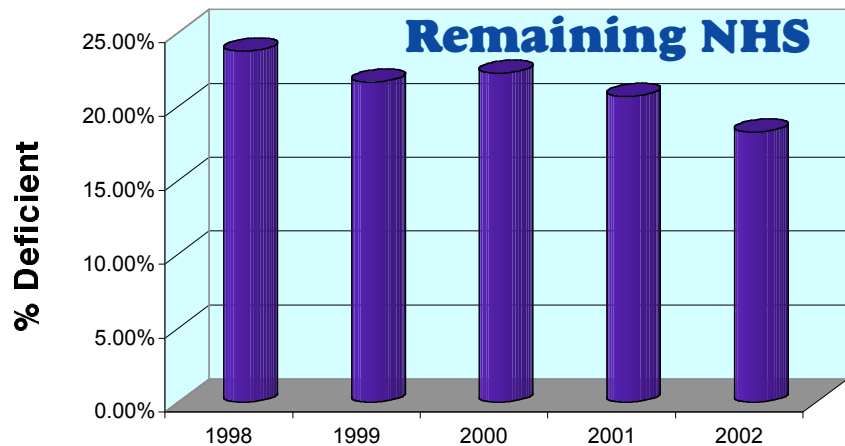
PAVEMENT DEFICIENCIES BY SYSTEM

The following graphs represent a summary of Idaho's five-year pavement performance on interstates, remaining National Highway System (NHS), and Non National Highway System (Non-NHS) routes.



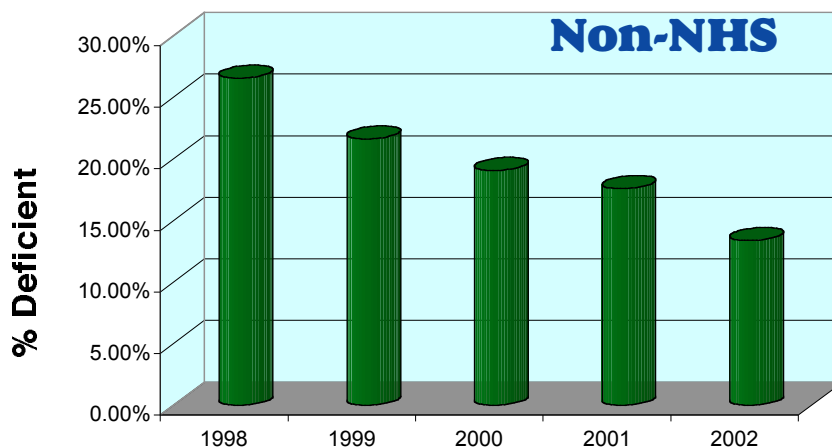
Interstate highways in Idaho have improved from 23% deficient in 1994 to 12% deficient in 2002, a reduction of 8% in eight years.

Figure 15.



The remaining (Non-Interstate) NHS routes have improved from 38 percent deficient in 1994 to approximately 18% deficient in 2002, a reduction of 20% in eight years.

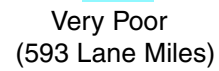
Figure 16.



Non-NHS route deficiencies have also been reduced from over 44% in 1994 to 13% in 2002, a reduction of 31% in eight years.

Figure 17.

(11,831 Lane Miles)







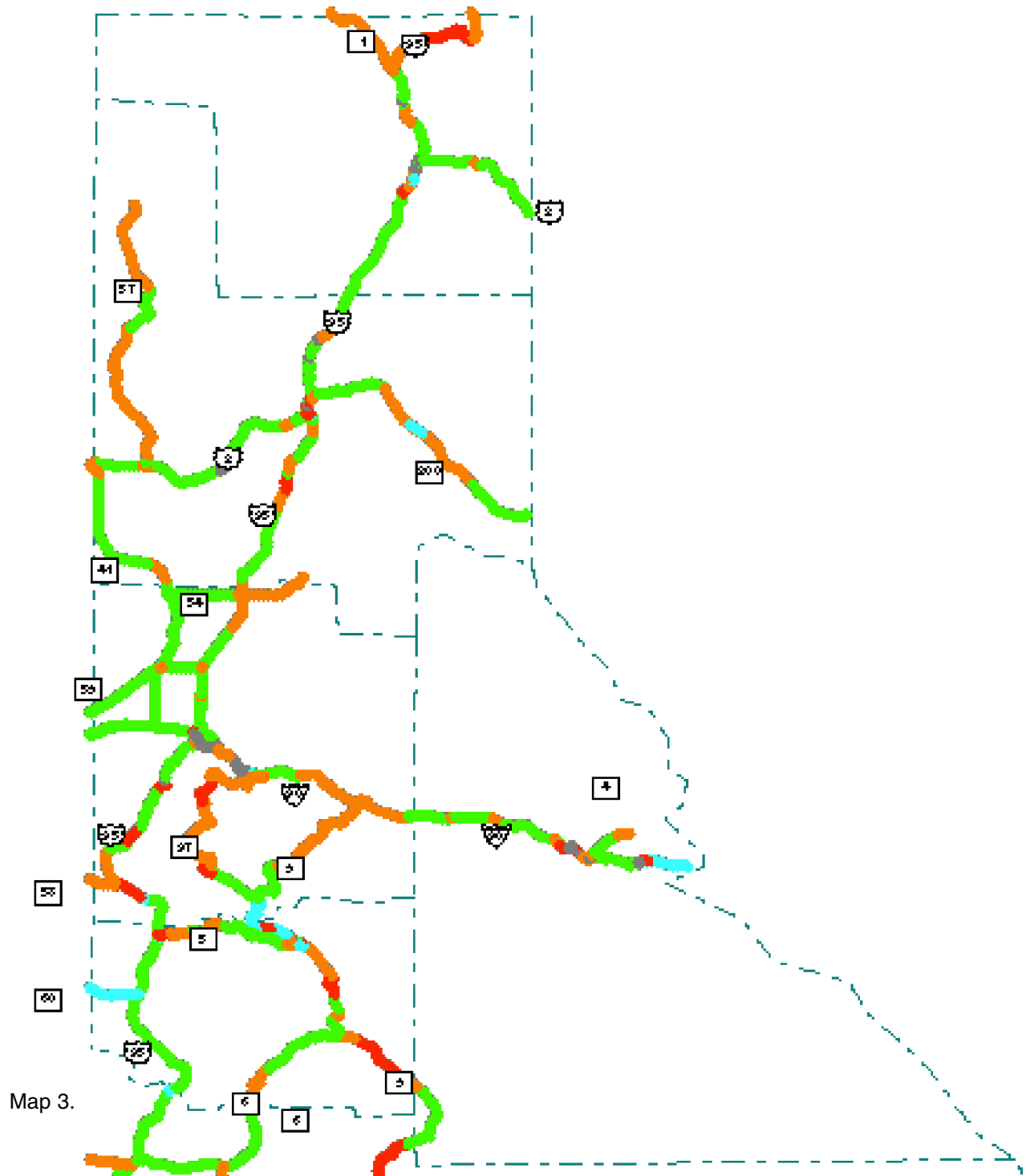
Map 2.

District 1

Pavement Condition Map

(1,434 lane miles)

			
Good	Fair	Poor	Very Poor
(818 Lane Miles)	(452 Lane Miles)	(114 Lane Miles)	(50 Lane Miles)

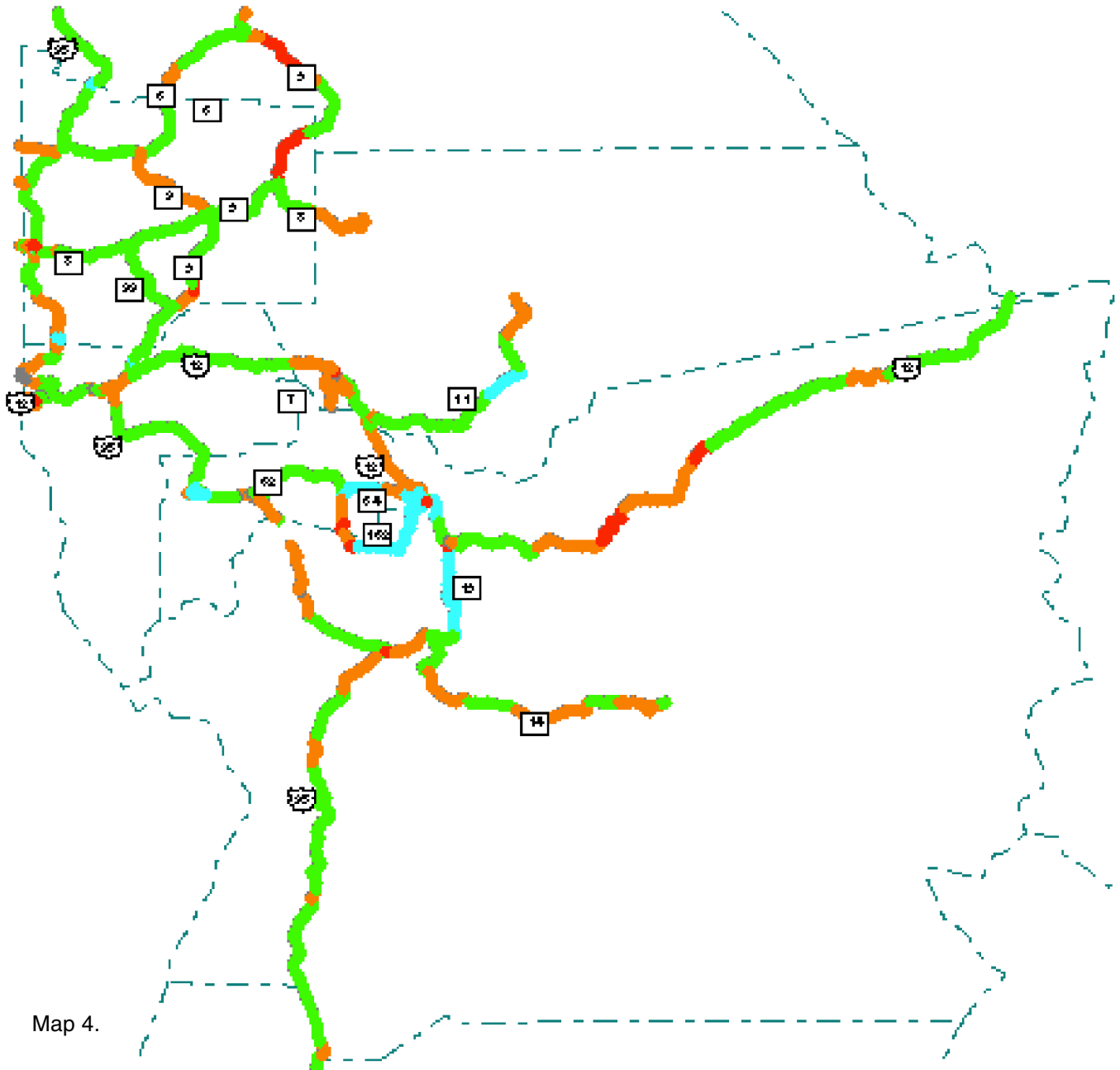


District 2

Pavement Condition Map

(1,460 lane miles)





			
Good	Fair	Poor	Very Poor
(826 Lane Miles)	(451 Lane Miles)	(64 Lane Miles)	(119 Lane Miles)

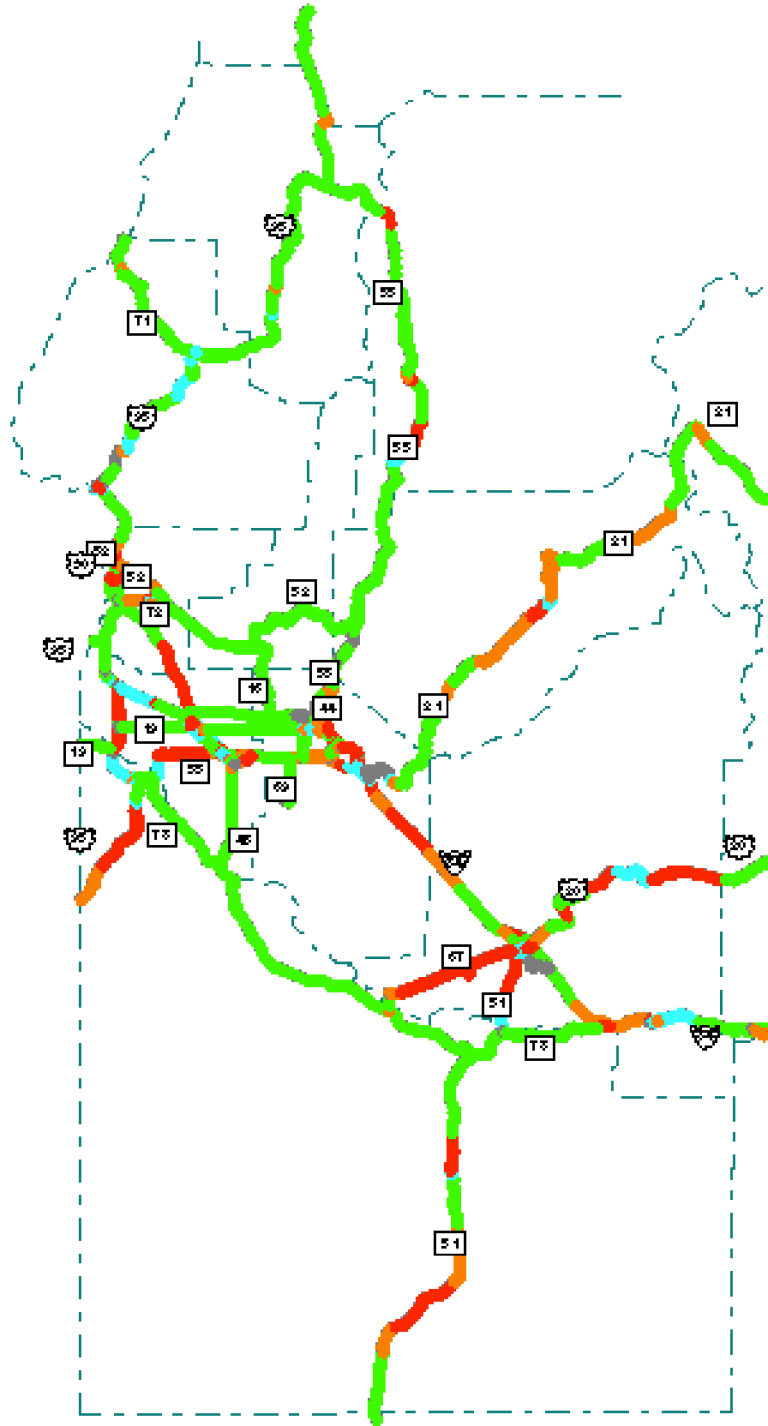


District 3

Pavement Condition Map

(2,523 lane miles)

			
Good	Fair	Poor	Very Poor
(1,550 Lane Miles)	(408 Lane Miles)	(413 Lane Miles)	(152 Lane Miles)







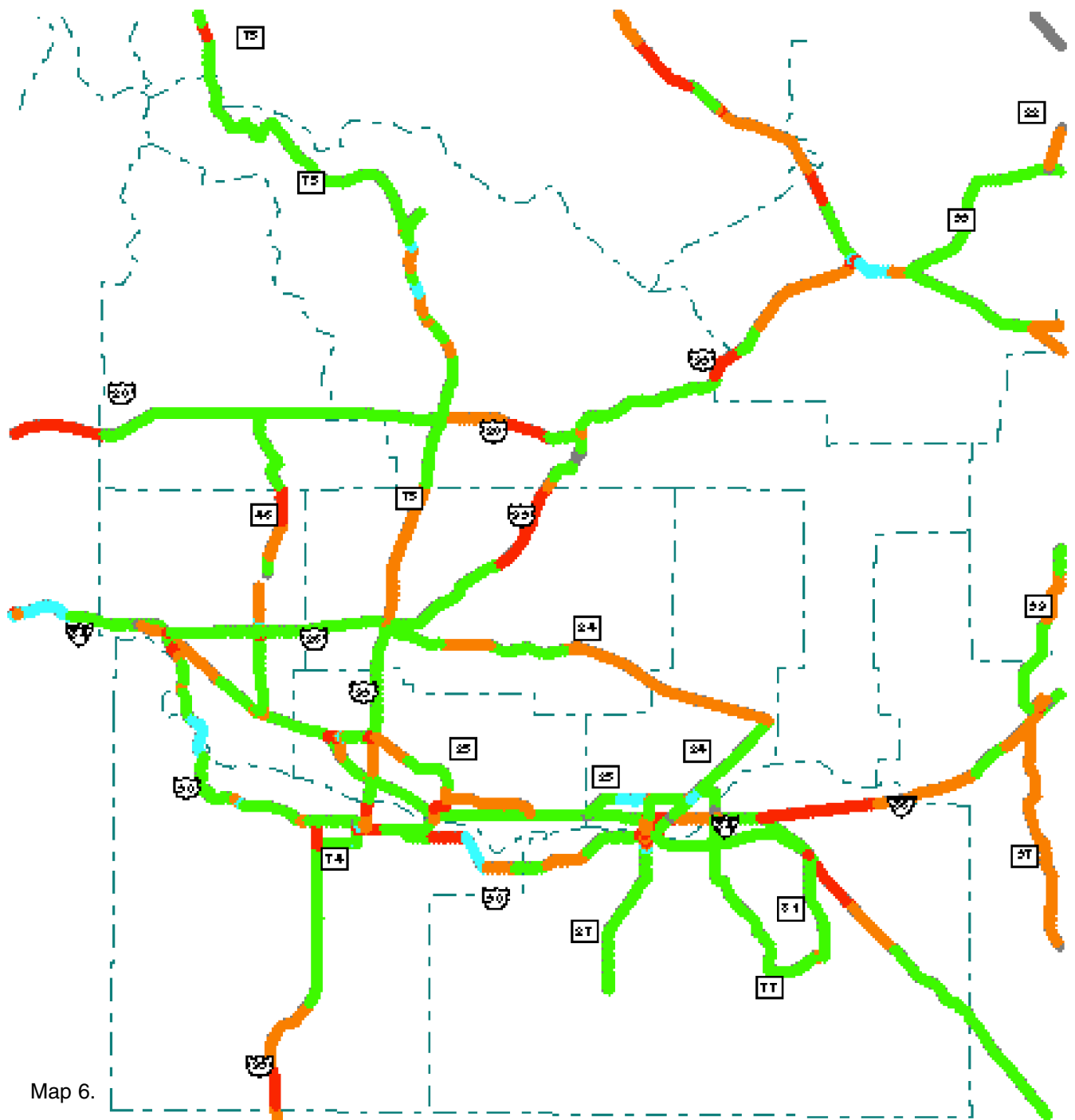
Map 5.

District 4

Pavement Condition Map

(2,329 lane miles)

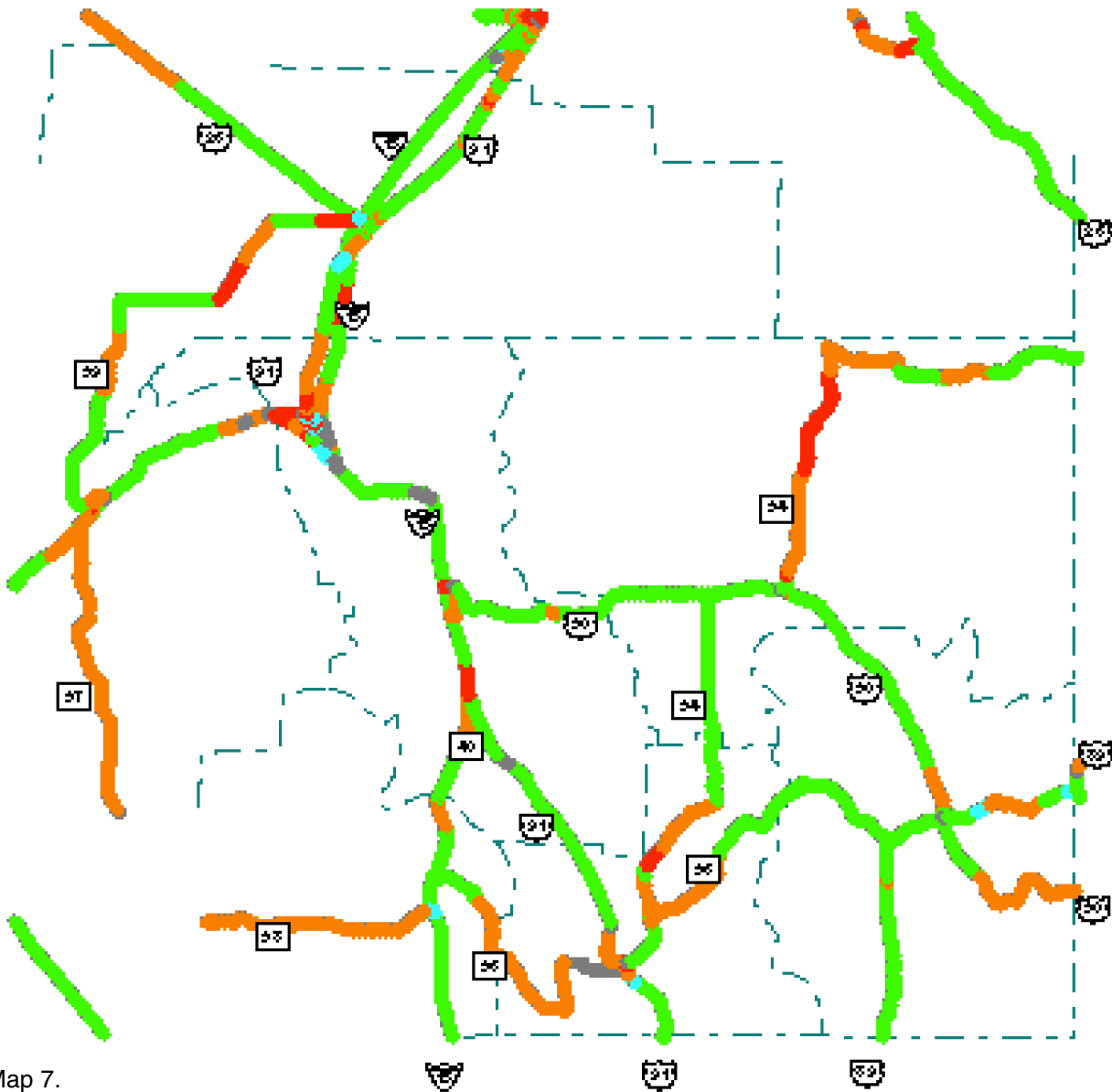
 Good (1,641 Lane Miles)	 Fair (409 Lane Miles)	 Poor (219 Lane Miles)	 Very Poor (60 Lane Miles)
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District 5

Pavement Condition Map

(1,813 lane miles)



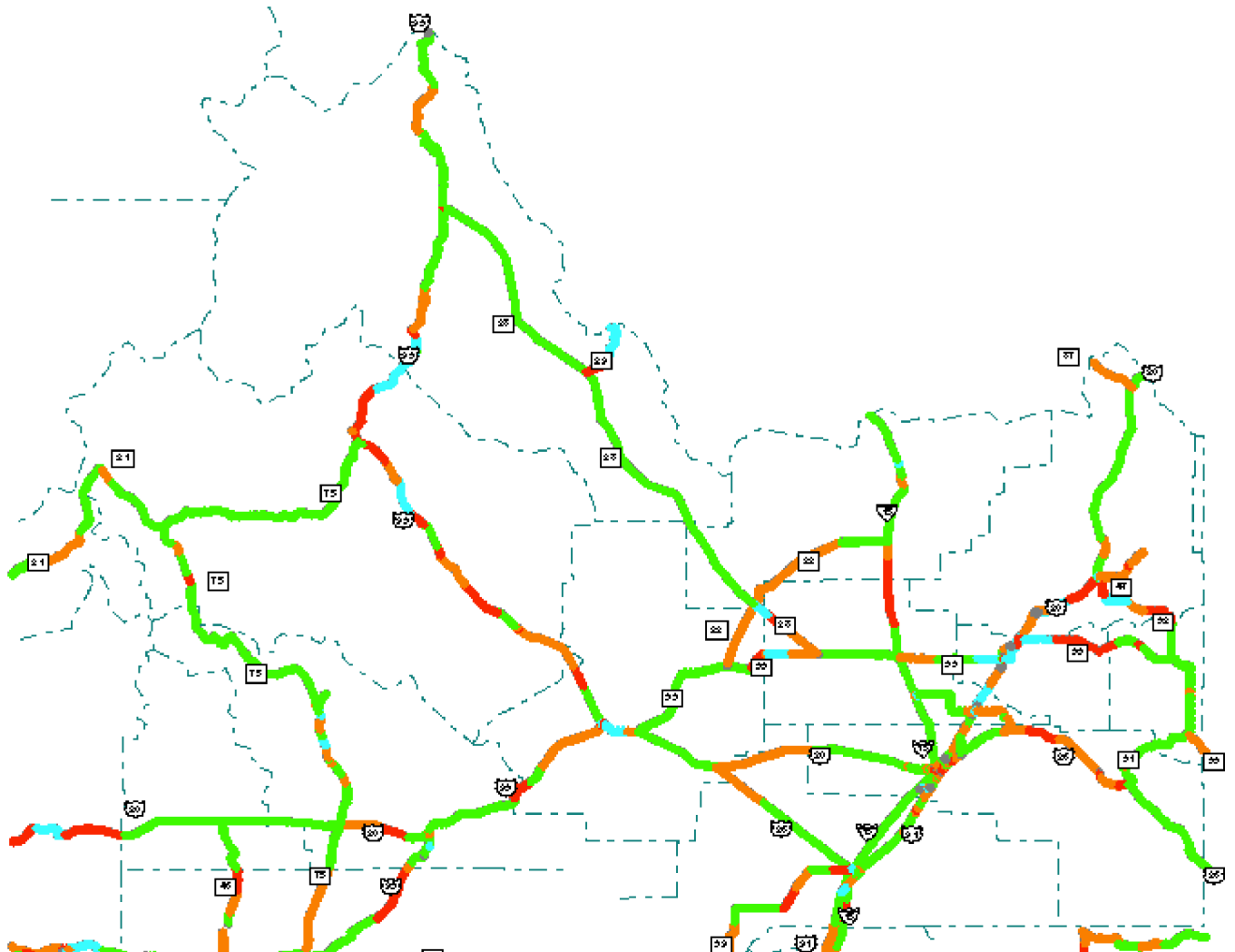
Map 7.

District 6

Pavement Condition Map

(2,272 lane miles)

			
Good	Fair	Poor	Very Poor
(1,248 Lane Miles)	(549 Lane Miles)	(256 Lane Miles)	(183 Lane Miles)



Map 8.

Section 4 NEEDS ANALYSIS



PAVEMENT NEEDS

The pavement-condition needs identified on the following pages were obtained through the Highway Performance Monitoring System - Analytical Package (HPMS-AP).

The HPMS-A/P is a model developed by the Federal Highway Administration (FHWA) to analyze data furnished to them by the states. The results of the analysis are used by the FHWA in policy development and for their bi-annual reports to Congress on the status and performance of the Nation's highways. This model has been adapted in-house and by consultant contract for ITD's use so that we may apply the same types of analysis to Idaho's pavement-management data.

The A/P's function is to analyze highway inventory data and to develop relationships

between various levels of capital investment, and the resulting condition of the State Highway System. It is a tool to help predict the effects of any proposed level of capital investment and the corresponding condition, safety, and service characteristics of the highway system. It responds to a variety of questions regarding the levels of investment necessary to accomplish desired objectives.

The Planning Services section has enhanced the program by modifying it to reflect:

- Idaho's costs (based on ITD project history files)
- The department's design standards
- Our minimum tolerable conditions

(continues on next page)

PAVEMENT NEEDS (continued)

The analytical package analyzes data related to:

- pavement condition,
- geometrics,
- roadway cross section,
- operation, and
- access control.

Among its many reports, the program produces a prioritized list of pavement-management sections, year of need, and the type and cost of rehabilitation.

Figure 18 is a graphical representation of pavement needs by district.

The table on page 27 is a summary of current pavement needs by district and functional class. Deficiencies are defined as very poor and poor pavements (based on roughness and cracking).

Deficient pavement is classified as needing either resurfacing or reconstruction, depending on the level and type of deficiency identified for individual pavement sections. Costs are based on the average project costs for Idaho over the last ten years.

The district maps on pages 28 through 33 identify the specific locations of pavement deficiencies and programmed highway projects in each district.



Pavement-management data allows the department to effectively prioritize highway projects across the state.
(Photo by Barbara Babic)

2002 Pavement Needs (Lane Miles)

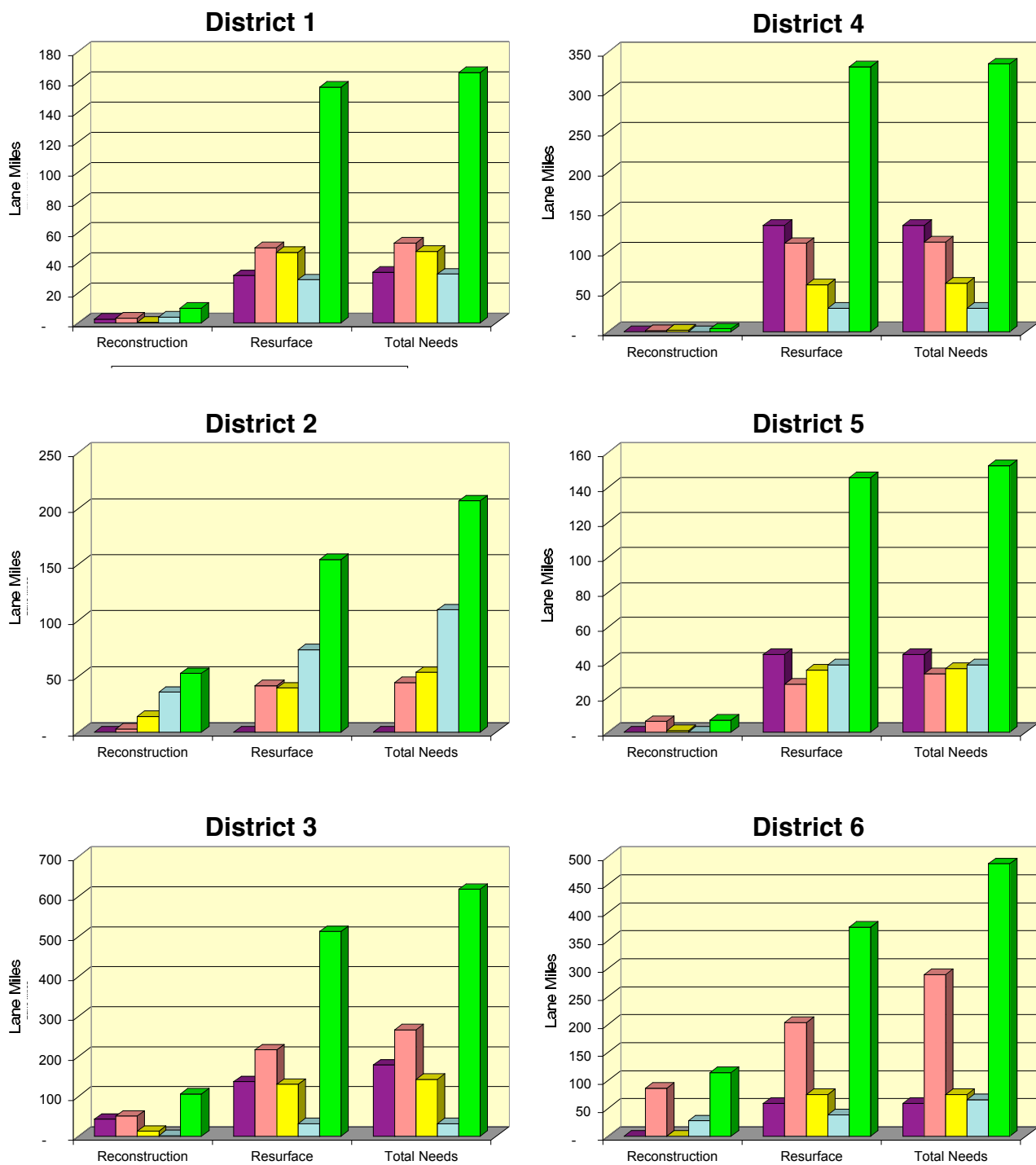


Figure 18.



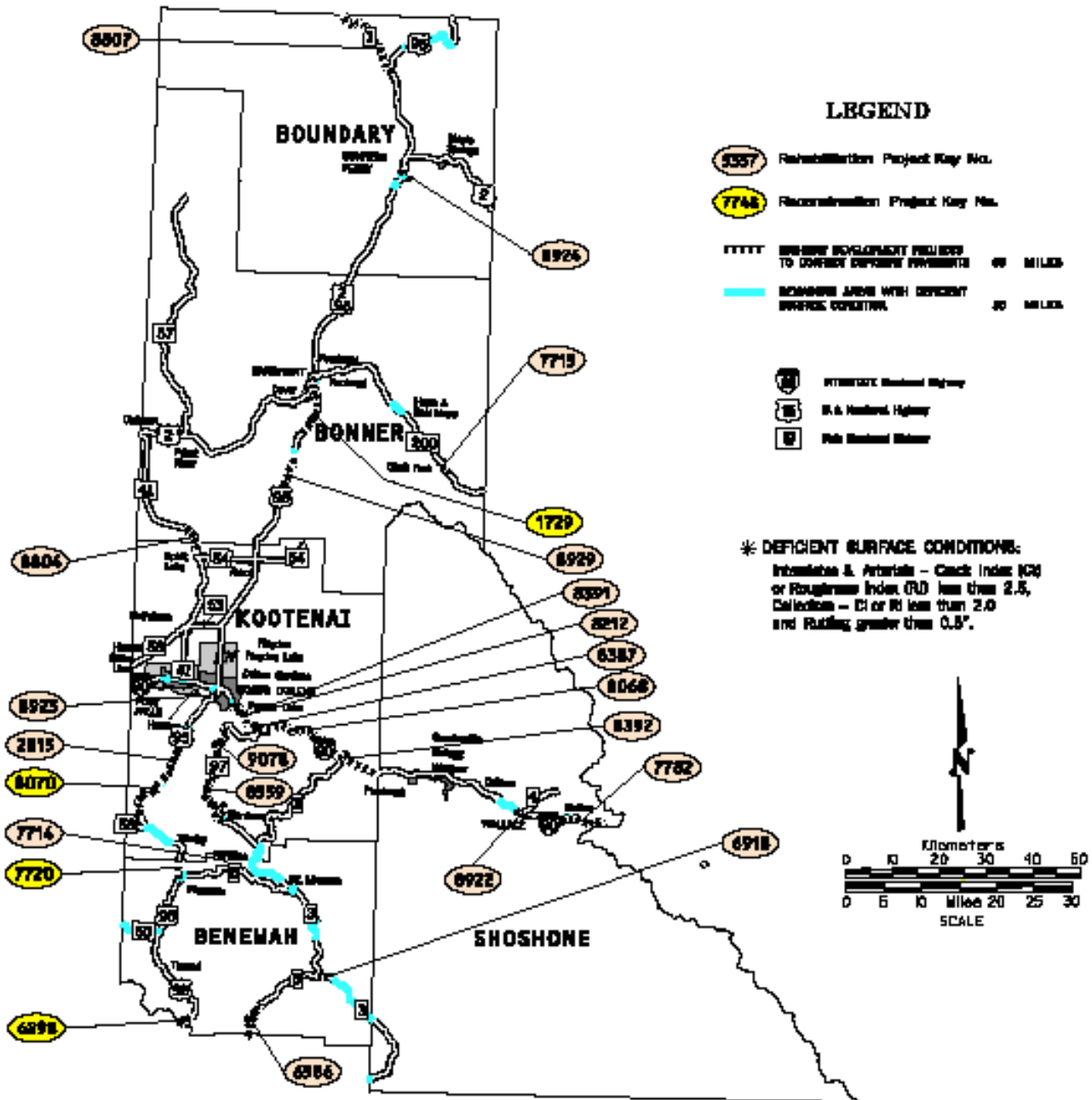
2002 Pavement Needs (State Highway System)

DISTRICT 1						
	RECONSTRUCTION		RESURFACE		TOTAL LANE MILES	TOTAL COST (\$000)
	DEFICIENT LANE MILES	COST (\$000)	DEFICIENT LANE MILES	COST (\$000)		
INTERSTATE	2	1,111	31	3,762	34	4,873
PRINCIPAL ART.	3	1,669	50	4,691	53	6,360
MINOR ARTERIAL	0	261	47	4,166	47	4,427
COLLECTOR	4	1,619	28	2,611	32	4,230
TOTAL	10	4,660	156	15,230	166	19,890
DISTRICT 2						
	RECONSTRUCTION		RESURFACE		TOTAL LANE MILES	TOTAL COST (\$000)
	DEFICIENT LANE MILES	COST (\$000)	DEFICIENT LANE MILES	COST (\$000)		
INTERSTATE	-	-	-	-	-	-
PRINCIPAL ART.	3	1,586	41	5,431	44	7,017
MINOR ARTERIAL	14	8,099	39	3,544	53	11,643
COLLECTOR	36	13,824	73	7,071	109	20,895
TOTAL	52	23,509	154	16,046	207	39,555
DISTRICT 3						
	RECONSTRUCTION		RESURFACE		TOTAL LANE MILES	TOTAL COST (\$000)
	DEFICIENT LANE MILES	COST (\$000)	DEFICIENT LANE MILES	COST (\$000)		
INTERSTATE	42	24,204	136	12,519	178	36,723
PRINCIPAL ART.	50	24,447	216	23,569	266	48,016
MINOR ARTERIAL	12	5,328	130	11,143	142	16,471
COLLECTOR	1	223	31	2,258	31	2,481
TOTAL	105	54,202	512	49,489	617	103,691
DISTRICT 4						
	RECONSTRUCTION		RESURFACE		TOTAL LANE MILES	TOTAL COST (\$000)
	DEFICIENT LANE MILES	COST (\$000)	DEFICIENT LANE MILES	COST (\$000)		
INTERSTATE	-	-	133	11,886	133	11,886
PRINCIPAL ART.	1	862	110	10,645	112	11,507
MINOR ARTERIAL	2	621	59	5,176	61	5,797
COLLECTOR	-	-	29	2,031	29	2,031
TOTAL	3	1,483	331	29,738	335	31,221
DISTRICT 5						
	RECONSTRUCTION		RESURFACE		TOTAL LANE MILES	TOTAL COST (\$000)
	DEFICIENT LANE MILES	COST (\$000)	DEFICIENT LANE MILES	COST (\$000)		
INTERSTATE	-	-	44	4,250	44	4,250
PRINCIPAL ART.	6	3,406	27	3,982	33	7,388
MINOR ARTERIAL	1	289	35	3,066	36	3,355
COLLECTOR	-	-	38	3,050	38	3,050
TOTAL	7	3,695	146	14,348	152	18,043
DISTRICT 6						
	RECONSTRUCTION		RESURFACE		TOTAL LANE MILES	TOTAL COST (\$000)
	DEFICIENT LANE MILES	COST (\$000)	DEFICIENT LANE MILES	COST (\$000)		
INTERSTATE	-	-	58	5,199	58	5,199
PRINCIPAL ART.	86	40,661	203	17,557	289	58,218
MINOR ARTERIAL	-	-	74	5,526	74	5,526
COLLECTOR	28	10,985	38	2,847	65	13,832
TOTAL	113	51,646	374	31,129	487	82,775
GRAND TOTAL	291	139,195	1,673	155,980	1,964	295,175

DISTRICT 1

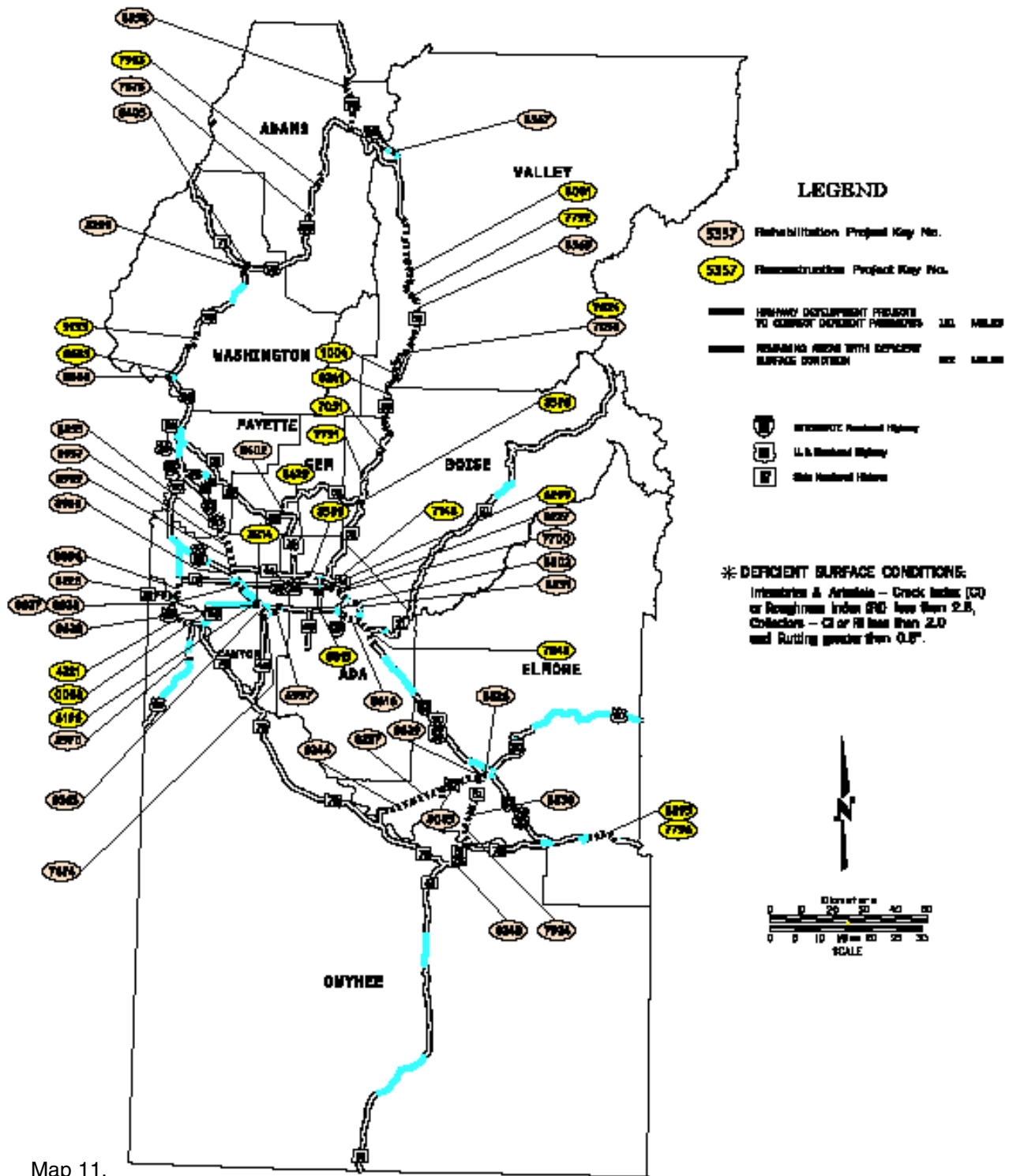
Programmed Projects vs. Pavement Deficiencies*

FY 2003 – 2007



Map 9.

DISTRICT 3 **Programmed Projects vs. Pavement Deficiencies*** **FY 2003 – 2007**



Map 11.

DISTRICT 4

Programmed Projects vs. Pavement Deficiencies*

FY 2003 – 2007



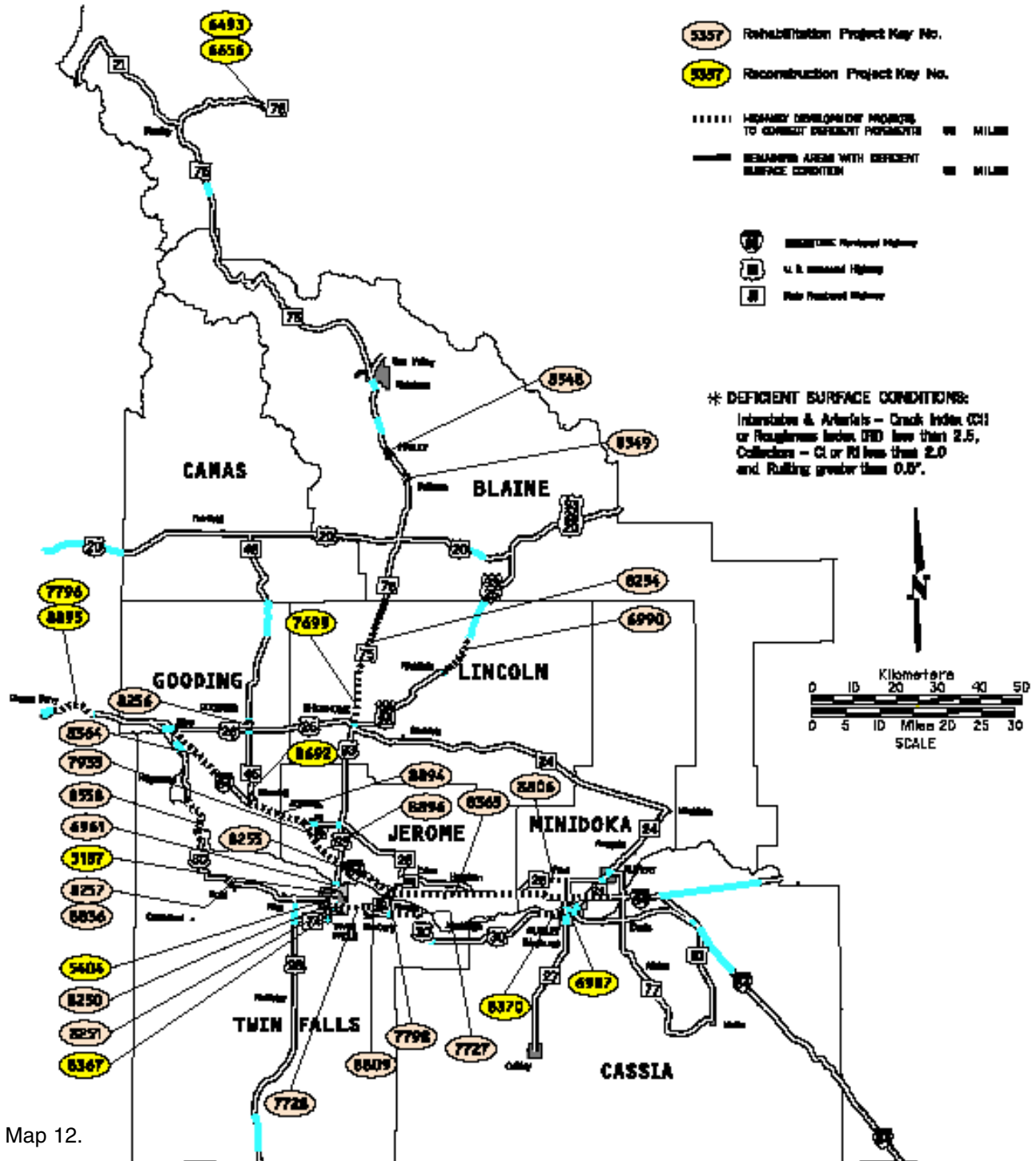
LEGEND

- 5357 Rehabilitation Project Key No.
- 5357 Reconstruction Project Key No.

- HIGHWAY DEVELOPMENT PROJECTS TO CORRECT DEFICIENT PAVEMENTS 0 10 20 30 40 50 MILES
- ===== REMAINING AREAS WITH DEFICIENT SURFACE CONDITION 0 10 20 30 40 50 MILES

- INTERSTATE Highway
- U.S. Highway
- State Road

* DEFICIENT SURFACE CONDITIONS:
Interstates & Arterials – Crack Index (CI) or Roughness Index (RI) less than 2.5,
Collectors – CI or RI less than 2.0
and Rutting greater than 0.5'.



Map 12.

DISTRICT 5

Programmed Projects vs. Pavement Deficiencies*

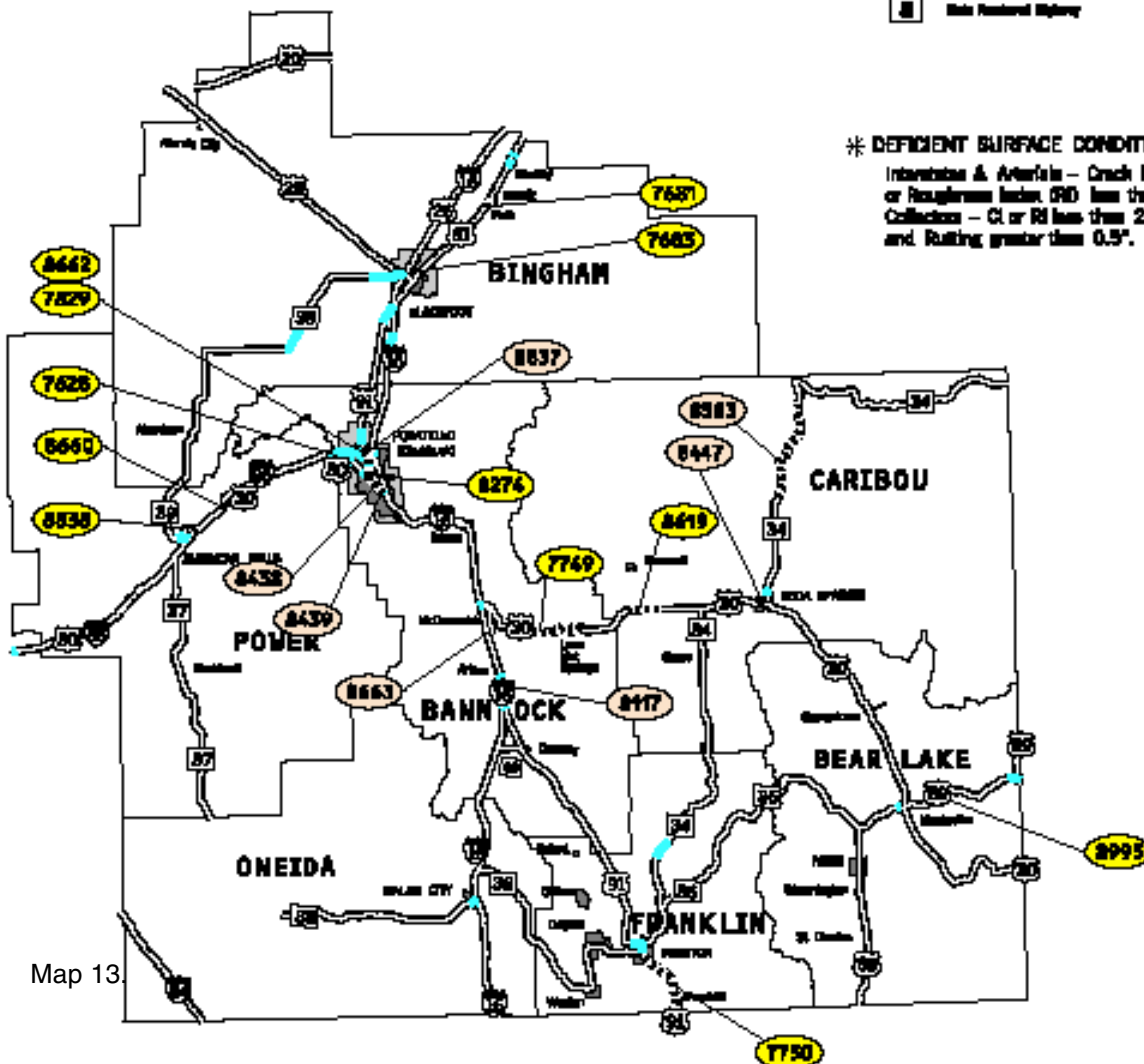
FY 2003 – 2007



LEGEND

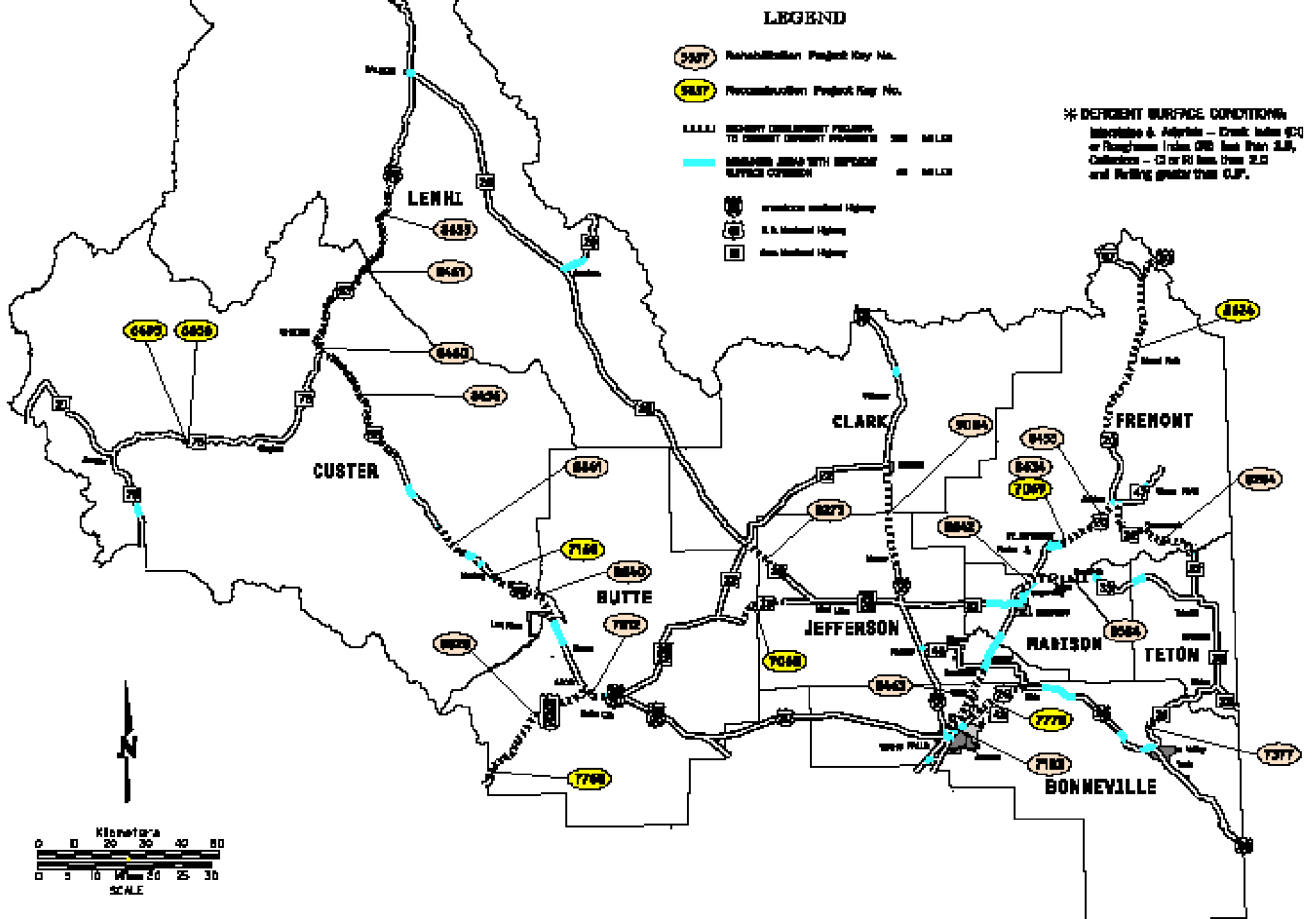
- 3337 Rehabilitation Project Key No.
- 5337 Reconstruction Project Key No.
- HIGHWAY DEVELOPMENT PROJECTS TO CORRECT DEFICIENT PAVEMENTS 32 MILES
- REMAINING AREA WITH DEFICIENT SURFACE CONDITION 36 MILES
- INTERSTATE Roadway Highway
- U.S. Highway
- State Roadway Highway

* DEFICIENT SURFACE CONDITIONS:
Interstate & Arterials – Crack Index (CI)
or Roughness Index (RI) less than 2.5,
Collectors – CI or RI less than 2.0
and Rating greater than 0.5*.





DISTRICT 6 Programmed Projects vs. Pavement Deficiencies* FY 2003 – 2007



Section 5 SEALCOATS



(Photo by Barbara Babic)

Sealcoats are an important part of the department's preventative-maintenance program. Preventative maintenance slows the rate of pavement deterioration which increases the service life of our highway system. Sealcoats help protect our pavements by reducing damage caused by oxidation and moisture and improve skid resistance.

Figures 19 and 20 provide a five-year look at sealcoats from a statewide perspective. Centerline and lane miles of sealcoat projects are tabulated for years 1998 through 2002.

Figure 21 shows the five-year average of lane miles sealcoated and the percentage of lane miles sealcoated by district.

District 6 has the highest "percentage" of lane miles sealcoated annually (15.6% or 322 lane miles).

Figures 22 through 27 show the miles sealcoated from 1998 to 2002 in each of ITD's six districts.

STATEWIDE FIVE-YEAR SEALCOAT HISTORY (1998 - 2002)

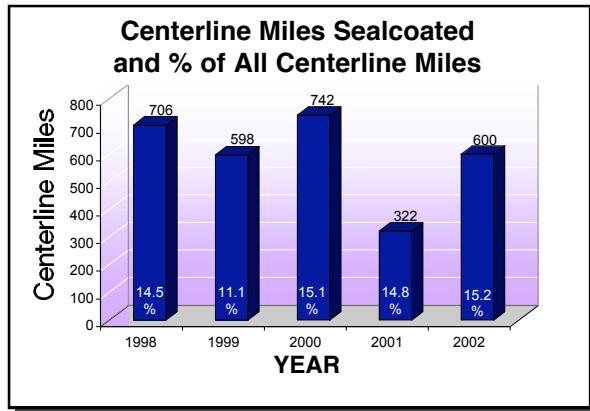


Figure 19

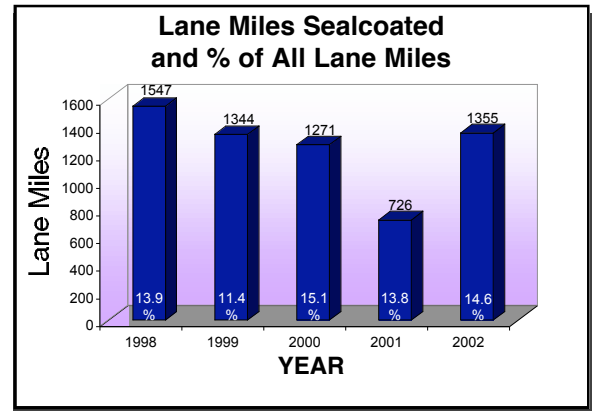


Figure 20

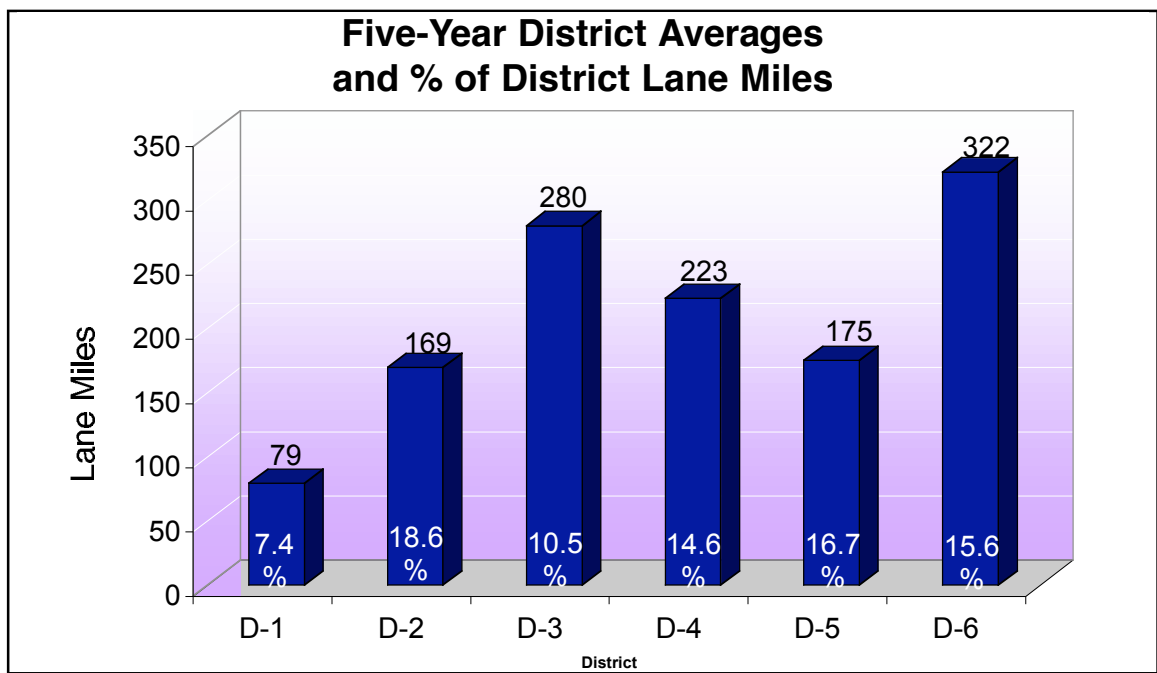
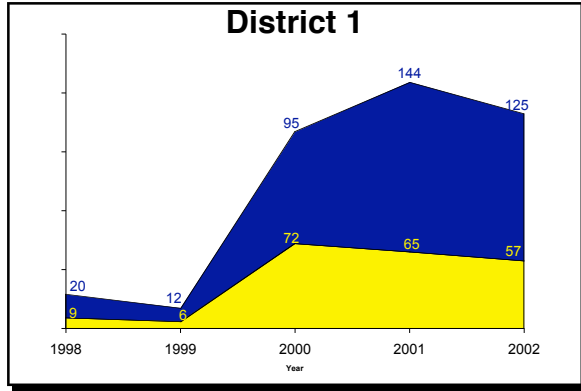
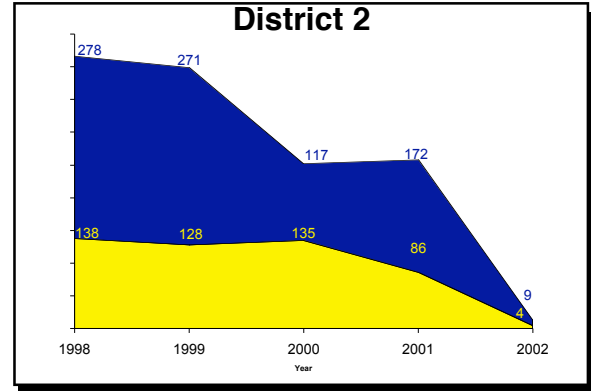


Figure 21

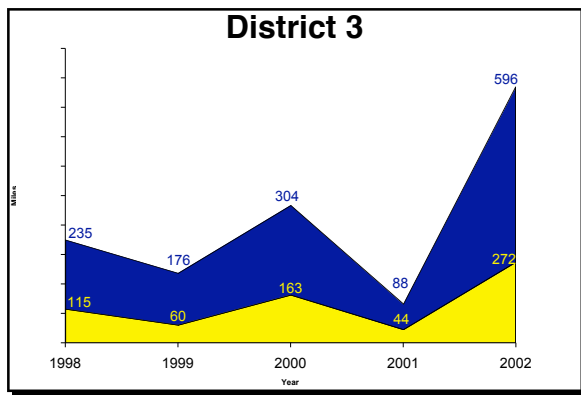
STATEWIDE FIVE-YEAR SEALCOAT HISTORY BY DISTRICT (1998 - 2002)



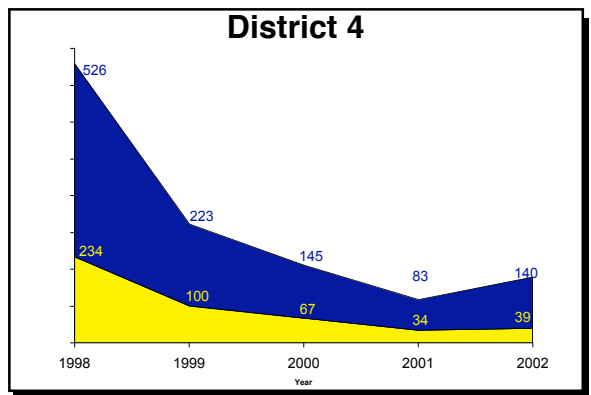
5-Year Lane Mile Average = 77



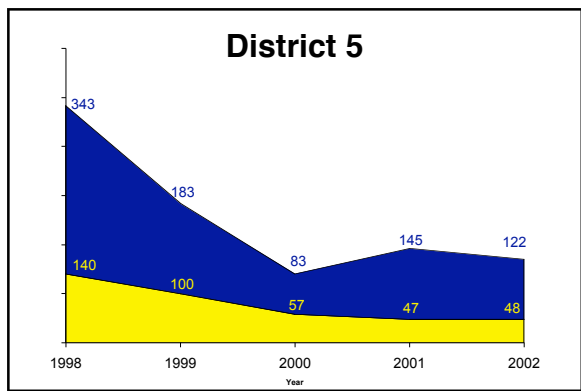
5-Year Lane Mile Average = 221



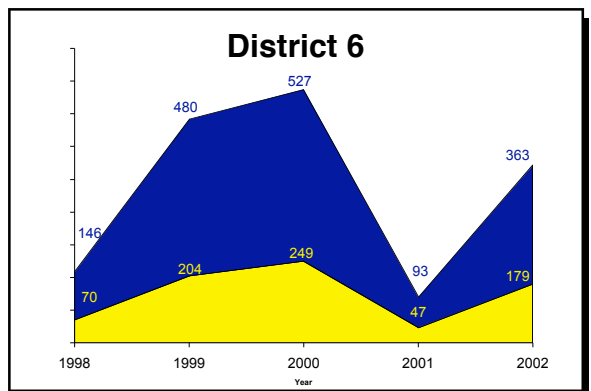
5-Year Lane Mile Average = 270



5-Year Lane Mile Average = 270



5-Year Lane Mile Average = 231



5-Year Lane Mile Average = 358

■ Lane Miles ■ Centerline Miles

Figures 22 through 27

Section 6 SUMMARY



MAINTENANCE, REHABILITATION, AND RECONSTRUCTION

Idaho is making significant progress in the reduction of pavement deficiencies on the State Highway System. Pavements that are considered deficient have declined from nearly 40% in 1993 to 15% by calendar year 2002.

This reduction in deficiencies can be attributed to:

- **Maintenance:** Sealcoats and other activities slow the rate of deterioration. The result of a strong maintenance program is that fewer deficiencies come on the system each year.
- **Rehabilitation:** The minor rehabilitation program has reduced pavement deficiencies. Under this program, pavements are resurfaced before they deteriorate to the

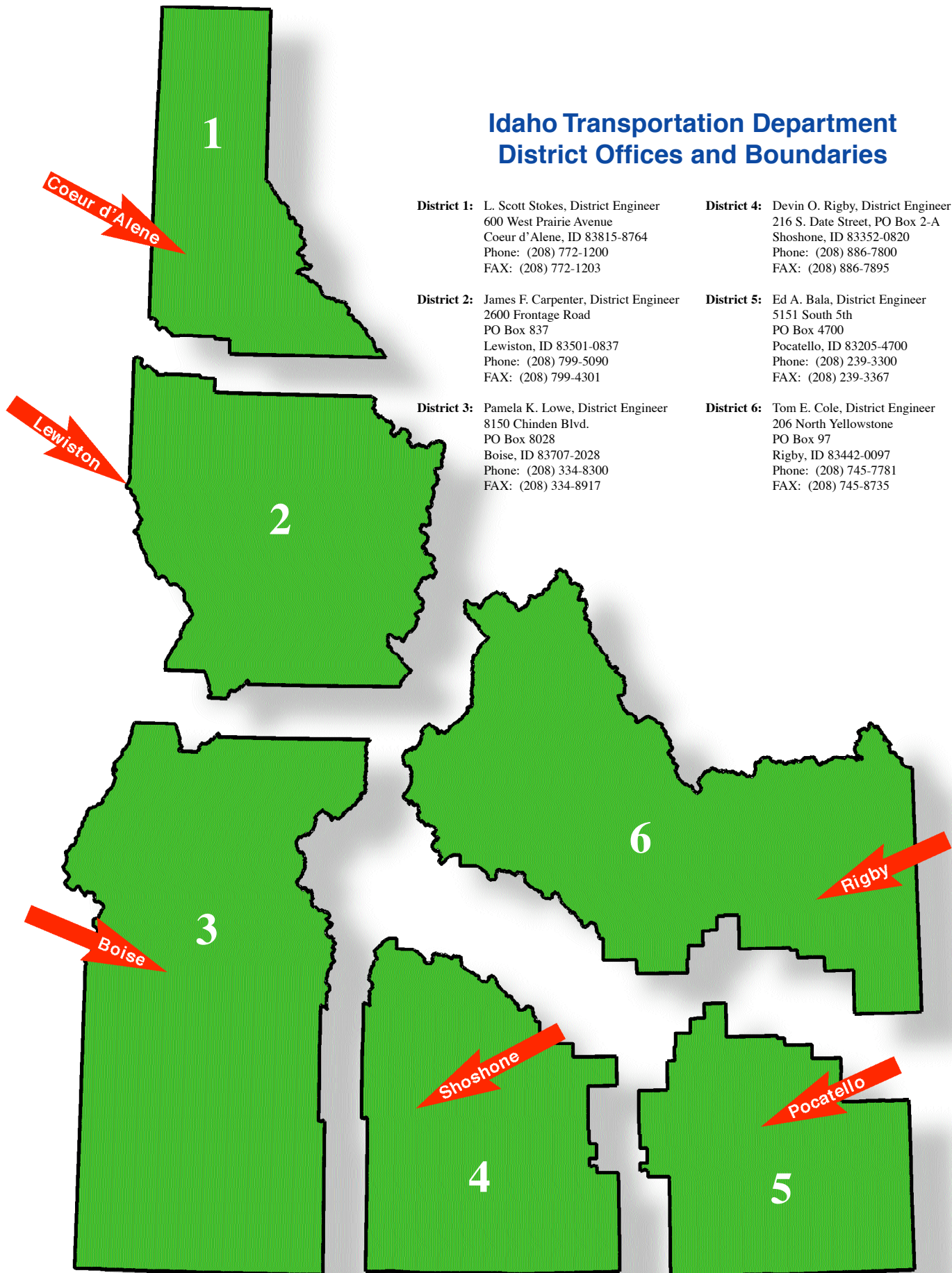
point that reconstruction is necessary. The program allows us to keep our pavements in good condition.

- **Reconstruction:** When pavements have reached the end of their service life an effective reconstruction program is necessary.

Maintenance, rehabilitation, and reconstruction are all appropriate tools that need to be used at different times in the life of a section of pavement. It is important to select the proper tool to use at the appropriate time. Wise future project selections will allow Idaho to continue:

- spending its limited roadway dollars wisely, and
- reducing roadway deficiencies and the rate at which roadways become deficient.

Idaho Transportation Department District Offices and Boundaries



VISIT OUR WEBSITE!



[WWW.STATE.ID.US/ITD/PLANNING](http://www.state.id.us/itd/planning)

The Division of Planning provides a variety of useful highway data, maps, reports, software, and transportation-related links on our web site. Listed below is a sample of the information available at www.state.id.us/itd/planning.

HIGHWAY DATA

Choose from a variety of tabular data about Idaho's state highway infrastructure.

SOFTWARE

The division has developed it's own software that you can download from our site to simplify the process of viewing Idaho's transportation-planning data.

PLANNING TOPICS AND RELATED SITES

Other topics and sites that may have useful transportation planning-related information.

If you need information about transporation in Idaho, our site is just a click away!



Pavement Management System